THE USE OF NONANALYTIC COGNITIVE PROCESSES IN EVALUATIVE JUDGMENT MAKING

By

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Making evaluations of objects, events and persons is a basic, pervasive human activity. In marketing, algebraic models of information integration have greatly influenced theory and research on how consumers form evaluations. Recently, the algebraic model approach to evaluative judgment making has been criticized on conceptual and methodological grounds. A proposed alternative is category-based evaluation. Rather than seeing evaluation as resulting from rule-based cognitive operations on a subset of the object's features, category-based evaluation assumes than an overall affective response already exists at the level of the category and that the processes that lead to the assignation of the object to a conceptual category also lead to its evaluation.

The goal of this research is to present and submit to an experimental test a conception of the process of making evaluative judgments that attempts to reconcile rather than oppose the analytic perspective of algebraic models with category-based, nonanalytic evaluation processes. This conception conceives of evaluation as a continuous, evolving internal reaction that follows a nonanalytic-to-analytic processing

sequence. Within this framework, the differential availability of category exemplars upon which similarity-based categorization decisions can be made, as well as the availability of cognitive rules that can be implemented to generate affective responses, is assumed to impact on one's willingness and/or capacity to engage in category-based versus rule-based evaluative processing.

An experiment was conducted in which antecedent learning conditions (rule/exemplars), presence of retrieval cues and judgment deliberation time were manipulated. The configuration of results provided support for the proposed conceptualizaton. Subjects' evaluative judgments were affected by retrieval cues when exemplars instead of rules were available in memory and the impact of the cues was more important when the time allowed for deliberation was shorter. Although some inadequacies in the experimental testing conditions were identified, the study suggests that this conceptualization deserves the attention of researchers interested in understanding the evaluative judgment making process.

CHAPTER ONE
INTRODUCTION

Among the many research topics in marketing and consumer behavior, the problem of how consumers come to develop evaluative responses to various market objects such as new products, brands or companies has probably been one of the most extensively studied. This comes as no surprise in disciplines where the ultimate concern is the understanding of the whole range of phenomena that precede and follow the act of buying consumer goods. It is a generally held belief in the marketing community that consumers are more likely to buy products and services that they like. Comprehending how liking and disliking originate in consumers' mind is therefore a fundamental research goal.

Over the years, one conception has clearly emerged as dominant in the thinking of researchers interested in the study of consumer evaluative judgment making. Often designated as the multiattribute or preference structure approach, the conception holds that consumers, and people in general, construct their evaluations of objects by considering the characteristics (attributes, elements, dimensions or features) of the objects that they perceive as relevant at judgment time. Typically, it is proposed that the evaluations of these characteristics serve as building blocks to generate overall affective responses. For example, a consumer may arrive at a positive evaluation of a new brand of toilet tissue after having concluded that it possesses at various degrees a

number of positively valued attributes such as strength, softness and pleasant scent (see Lutz, 1981).

From a marketing viewpoint, the multiattribute perspective on evaluation has much to be satisfied with. It offers a basic framework from which several strategic implications for product and advertising management can be derived (Cohen, 1974; Lutz, 1975, 1981). However, from the viewpoint of bringing understanding of the process underlying the formation of evaluations, multiattribute theory may be less satisfactory. For instance, the assumption that consumers allocate processing time to feature evaluation and overall integration each time an evaluative judgment is made seems at odds with the fact that a multitude of such judgments are probably made daily. Somehow, there must be simpler ways of assessing the goodness of stimulus objects. Also, the multiattribute approach remains silent about what happens affectively during the time interval that separates stimulus exposure and final evaluative response. This hold-your-breath view can be criticized for its incompleteness in describing the phenomenon.

The goal of this research is to present and subject to an experimental test an alternative conception of the process of making evaluative judgments that attempts to solve some of the conceptual ambiguities associated with existing theoretical models. The proposed conception borrows heavily from recent work in cognitive psychology on how individuals organize their perception of the world. One basic idea that permeates all aspects of the proposal is that this perceptual organization is not restricted to purely cognitive interactions but also implies the processing of mental elements that possess affective qualities. Thus,

primary evaluative responses are believed to evolve naturally from the perceptual process. This conceptualization is described more fully in subsequent chapters.

The organization of the dissertation is as follows. Chapter Two examines current thinking and research orientations on the evaluative judgment making process. Chapter Three presents the conceptual framework and the research propositions that have guided the research study. The experimental procedures are described in Chapter Four. Chapter Five reports and discusses the empirical results. The final chapter presents some of the conceptual and methodological limitations of the study and suggests future directions for research.

CHAPTER TWO
PERSPECTIVES ON EVALUATIVE JUDGMENT MAKING

Making evaluations of objects, events and persons is a basic, pervasive human activity. For some authors (Osgood, 1969; Zajonc, 1980, 1984) the very first inferences that are made when one encounters a stimulus are often evaluative in nature (e.g. good/bad, pleasant/unpleasant). Unsurprisingly, most of the trait words in the English language are strongly evaluative (Allport and Odbert, 1936) and the primary dimension of meaning has been repeatedly shown to be evaluative as well (Osgood, Suci and Tannenbaum, 1957).

This tendency to evaluate is probably an evolutionary heritage; the survival of the human species has depended on the ability of its members to appraise rapidly the goodness of any given situation so as to avoid the harmful and reach for the beneficial. It is quite understandable then that a great deal of psychological research has been concerned with how people arrive at evaluative judgments. In fact, there are so many aspects of social life that are related to evaluation that it would be almost an impossible task to review the scientific literature that has been generated through the various studies conducted on these aspects.

The objectives of this chapter are more modest. The intent is to show that a great deal of the theory and research on how individuals form evaluations has been characterized by an abstract, computational orientation, largely ignoring the possibility of there being less deliberative evaluation processes. The areas of psychological research that

are particularly illustrative of this orientation are those that have been dealing with the formation of impressions and attitudes. The literature in these two areas has been dominated by algebraic models (viz. summative and weighted averaging) of information integration.

The chapter begins with a presentation of the algebraic model approach to evaluative judgment making. The focus is exclusively on the impression and attitude formation research literatures. Following this general overview, the consumer behavior body of theory and research in attitude formation is examined. Finally, some important weaknesses of the computational perspective are enunciated and promising alternative proposals are presented.

Evaluation and Affect

It seems rather important at the onset to specify the nature of evaluative judgment making and to clarify certain issues concerning its affective qualities. Recently, the term affect has been very present in the psychological literature (see e.g. Clark and Fiske, 1982). Several factors probably account for this sudden interest. First, there are the provocative and research challenging proposals made by Zajonc and his co-workers (Zajonc, 1980; Zajonc and Markus, 1982) concerning the independence and primacy of affect over cognition. The proposals have triggered some lively debates over methodological (Birnbaum and Mellers, 1979a, 1979b; Moreland and Zajonc,1977,1979) and philosophical (Lazarus, 1982,1984; Zajonc, 1984) issues and have set the stage for extended research in the area. Second, the concern with affect may be seen as a reaction to the rapid borrowing of the theories and research methods of cognitive psychology and their application in the social domain (Fiske,

1981; Higgins, Kuiper and Olson, 1981). It is as if the whole field of social cognition needs to outcry its primary interest in matters of personal, social life, albeit within the perspective of cognitive theories and methodologies.

Whatever the causes, affect has now become an important object of study within social cognition and one needs to be precise when terms like evaluation, emotion, preference, attitude and so on are employed. The position taken here is that an evaluative judgment is a statement of goodness made by an individual about an object (person, behavior, event). The additional characteristic is that this judgment need not necessarily be accompanied by affect, which in the present view involves also an emotional state. The corollary to this is that the phenomenon of evaluative judgment making can be studied with or without reference to affective, emotional, arousal-like states.

The distinction between evaluation and affect has been made by some theorists. Mandler (1982), for instance, refers to evaluative and affective cognitions. Only these latter are associated with physiological arousal. Fiske (1981) also contends that preferences and simple evaluations are not cut from the same cloth as emotions which are richer, more complex and probably multidimensional. In the area of mood research, Bower and Cohen (1982) have proposed a memory network theory of emotional behavior in which they conceive of emotions as memory nodes that can be activated by stimuli of many kinds. Interestingly, they argue for a distinction between nodes for the emotional feeling itself, the concept of emotion and the word that corresponds to the name of that concept. Their distinctions appear similar to those of Mandler (1982)

and Fiske (1981). That is, one can feel that an object is good/bad (affect), know that it is good/bad (concept-evaluation) and say that it is good/bad (name).

The present research is more concerned with evaluation than it is with affect. It seems rather obvious that an evaluative judgment does not capture affect in its entirety. But, apart from the physiological aspects, there is no clear indication that one needs more than valence to get what Fiske (1981) calls "a working definition of affect" (p.235). Therefore, in this chapter and in the following, the focus is on the psychological side of affect, though it is not excluded that during the making of the evaluative judgment physiological reactions can occur and be the object of cognitive interpretation.

There is another more pragmatic reason for limiting the inquiry to evaluation. The context of this study is consumer cognition. Recently, the field of consumer behavior has witnessed a large number of attacks on what has come to be called the high involvement model of consumer behavior. Most consumer researchers now believe that for a majority of situations consumers are characterized by a low level of involvement; that is, they do not care much about either products, advertisements, or decisions. One author went so far as to suggest that to think of consumers as decision makers or having attitudes about products is a case of anthropomorphism (Kassarjian, 1978). Clearly, this perspective concurs with the suggested narrowing of affect to simple evaluation. Perhaps, consumers often do not feel anything about products, but they probably can tell if they are good or not. Moreover, if involvement is conceived of as activation or arousal (see Cohen, 1983),

affective reactions would be present whenever evaluative cognitions are formed in a high involvement situation.

A final note needs to be made before examining some of the major research traditions in evaluative judgment making. It might seem dangerous to some people to put aside the affective qualities of evaluation. This could blur the distinction between evaluation and category judgment. In fact, some researchers have suggested that an evaluative judgment should be considered identical to a category judgment (Wyer, 1974; Wyer and Carlston, 1979). Thus, to say that product x is good would be equivalent to assigning product x to an evaluative category, just as product x could be assigned to the "furniture" category. In that case, there seems to be little value in theorizing about and doing research on evaluative judgment making any differently from human judgment making in general. Yet, the evaluation and judgment making literatures remain fairly separate, which is evidence that psychologists do make a distinction. Moreover, it appears that it is not necessarily in the affective characteristics of evaluation that the distinction lies. For instance, Cooper and Croyle (1984) in their recent review of attitude research note that "the current literature is practically devoid of any mention of affect, emotion, or arousal" (p. 396).

It may be that because of its ubiquity in social life, evaluation has been accorded a privileged status and consequently has been differentiated from other more cognitive judgments. But there is probably more to it than status. As Mandler (1982) argues, the process of making evaluative judgments seems rather different from the process of making descriptive judgments. While the latter are "grounded in consensually

established sets of features or attributes" (p. 13), evaluations depend more on one's own expectations and the congruity between these expectations and the object of evaluation. He notes that the preponderance of the self in evaluation is seen in the greater variance in people's judgments of what constitutes a good or bad object as opposed to their judgments of what category the object is a member of.

The importance of evaluation also suggests that humans must have developed efficient ways of evaluating the objects they encounter. For example, when an object is presented, affect could be stored in memory along with other cognitive elements so as to facilitate subsequent evaluations of the object (Lingle and Ostrom, 1981). Assuming this is the case for all concepts in one's mind, it is understandable then that evaluation plays such a crucial and distinct role in cognition; no other inferential judgment can be said to be that omnipresent.

These observations support the notion that evaluation, even disassociated with arousal, is in itself different from other kinds of judgments and must be studied as such. The next section in the chapter takes a look at how social psychologists have conceptualized and studied the evaluative judgment making process.

The Algebraic Model Approach to Evaluation

Mathematical models are used extensively in psychology, in such diverse areas as motivation (e.g. Atkinson and Birch, 1978), interpersonal attraction (e.g. Byrne, 1970), decision-making (e.g. Slovic and Lichtenstein, 1971), natural object categorization (e.g. Reed, 1972) and so on. Theory and research in evaluative judgment making have also been strongly influenced by mathematical formulations. This is

particularly true of the impression and attitude formation literatures where the algebraic model orientation remains a widely accepted research standard.

The central feature of the algebraic approach is that a mathematical rule is postulated to represent cognitive functioning. In most applications the rule is a simple summation over some parameters that correspond to specific psychological referents. These are mentally encoded representations of external or internal stimuli that the person selects for processing. Although not always presented this way, there is an implicit sequential process that underlies the algegraic model approach to the formation of evaluative judgments. The process is summarized in Figure 2-1 which is adapted from Chakravarti and Lynch (1983).

The interpretation of Figure 2-1 is straightforward. From the array of potential stimuli (Φ_1, Φ_2, ..., Φ_n) which are located either in memory or in the external environment, the individual selectively attends to and processes a certain number of aspects ($\emptyset_1$, $\emptyset_2$, ..., $\emptyset_n$). To arrive at the psychological evaluative reaction (ψ), an integration process is performed on the psychological counterparts of the selected stimuli (s_1, s_2, ..., s_n). Finally, the psychological response is mapped into an observable response (R), for example with the help of a rating scale. As this presentation makes it clear, the rule is but one characteristic of the algebraic model approach. There are a few other observations that are worthy of consideration before examining some applications of that conceptualization.

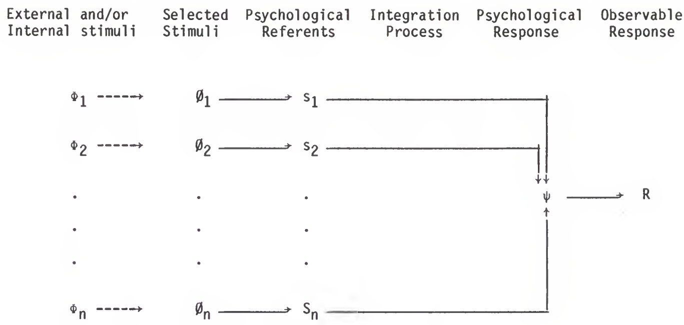

Figure 2-1. The Algebraic Model View of the Evaluative Judgment Making Process.

Basic to the algebraic model perspective is the assumption that humans are active information processors. They attend to and encode stimuli, make inferences, store information in memory and retrieve information from memory. Although limited in their processing capacity, they can accomplish many remarkable cognitive operations. This is in sharp contrast with other views which conceive of an evaluative response as being the resultant of classical conditioning processes (e.g. Staats and Staats, 1958). The information processing view is certainly not a distinctive feature of this approach. However, it seems important to note that the algebraic model conception embraces the ideas of a larger theoretical framework that guides much of current psychological research.

Figure 2-1 clearly implies that evaluation is essentially post-cognitive. According to this view, an evaluative judgment is arrived at after performing a series of cognitive operations on the information. These operations occur at each stage of the model. Thus, cognitive mechanisms must be postulated to explain the selective filtering of stimuli, the encoding of stimuli, their integration into an overall implicit evaluative response, and the transformation into a given response language. Although researchers adopting this approach implicitly or explicitly recognize the necessity of considering each of these aspects, the emphasis has been on the integration process where algebraic models have been proposed to represent that cognitive activity. Even if proponents of these models take great care in distinguishing between the integration process and the psychological referents that are combined via the algebraic rule, integration still remains the essential issue

since the psychological referents themselves are often evaluative and similar integration processes are suggested to explicate them (see e.g. Anderson, 1981b, p. 376; Fishbein and Ajzen, 1975, p. 398).

Given the importance of the process of integration, one would think that the issue of algebraic representation would be given serious consideration. Yet, what is meant by a mathematical model "describing" or "representing" information integration is not at all clear. For some, the interest of these models lies uniquely in their capacity for predicting the pattern of results obtained in studies with human subjects. The models are very predictive indeed (Dawes, 1979). For others, the correspondence with cognitive execution is more direct. For instance, Anderson (1981b) suggests that the computations associated with a proposed algebraic attitude model are "intuitive, at an unconscious level" (p. 364). Finally, there are those who simply do not address the problem.

It is a characteristic of this approach that it is concerned exclusively with the effects of specific processes--namely the integration of psychological entities--on evaluation. Clearly, it does not preclude the occurrence of other cognitive operations like those associated with the encoding of information, but it ignores their possible impact on the process. Consider for example the case of a person who is asked to make an evaluative judgment of an object. Most likely the person will try first to understand what the object is. This interpretation process is very complex and is usually described as a dynamic interplay between available information and knowledge stored in memory (see e.g. Neisser, 1976). It is conceivable that the encoding process

itself generates evaluative reactions. For instance, Mandler (1982) argues that the analysis of the evaluation object implies the search for a cognitive structure, which he calls a schema. When there is congruity between the variables of the schema and the variables of the object, positive evaluation occurs. This evaluative response is obviously primitive and Mandler (1982) recognizes that further mental activity may be necessary to finalize the judgment, especially when there is incongruity. The point is however that the algebraic model perspective cannot account for these evaluative reactions. In fact, within this perspective evaluation is seen as an end result of highly specified cognitive operations and not as an evolutive internal response that can be fed through diverse psychological processes.

With these introductory comments as background, two very influential conceptions of the evaluative judgment making process that exemplify the algebraic model approach are examined.

Impression Formation and Information Integration Theory

As mentioned in the introduction to this chapter, interactions with the external world are likely to involve frequent evaluations of objects, including persons. The psychological literature has traditionally drawn a distinction between evaluation of natural and social objects, probably because the latter are more complex, have thinking and acting abilities and more influence in structuring our lives. The formation of impressions of people has been a very active research area within social psychology, and one where the algebraic model orientation has found great support.

According to most accounts, the interest in impression formation traces back to the classic article by Asch (1946) reporting on some original studies on how people construct an overall representation of a person's personality. The experimental procedure employed by Asch (1946) was fairly simple. It consisted in presenting to groups of subjects a list of personality traits that supposedly referred to a single person. Subjects were asked to write a short description of the person and to further describe him/her with other available traits. These were presented as pairs of antonyms of which subjects had to choose the one they thought characterized the person best. Asch (1946) showed that, provided with such an artificial stimulus array, subjects were capable of forming an integrated impression of the person. Moreover, the impression appeared to be quite dependent upon some central traits. For example, when the trait "cold" was substituted for "warm", it had a significant impact on subjects' selection of descriptors. Asch (1946) interpreted his results in terms of a change-of-meaning explanation. He believed that impressions form integrated wholes so that the meaning of each trait depends on every other trait. Much of the subsequent research using Asch's (1946) experimental procedure focused on this change-of-meaning hypothesis.

It is out of this research tradition that has developed one of the most influential algebraic formulation of evaluative judgment making. Contrary to Asch's (1946) contentions, it has sought to demonstrate that an impression, or more precisely the evaluation of a person, is the result of a summative combination of the evaluative aspects of the traits that describe that person. The mathematical statement that

embodies this central thesis is part of a larger theory of information integration proposed by Norman Anderson (1974, 1981a).

The main ideas of information integration theory have already been alluded to while discussing the sequential process presented in Figure 2-1. In Anderson's (1981a) terms, the process of transforming the selected stimuli ($\emptyset_1$, $\emptyset_2$, ..., $\emptyset_n$) into psychological or scale values (s_1, s_2, ..., s_n) is referred to as valuation. It is assumed to occur prior to and independently of integration which is described by algebraic rules, also termed cognitive algebra. The mathematical models that are considered in the various applications of the theory are either summative (including averaging, adding and subtracting) or multiplicative (including multiplying and dividing).

One particular version of the summative model that has been dominant in Anderson's (1981a) extensive research program on person perception is the weighted averaging model. Assuming a set of n selected stimuli, the model's symbolic representation is:

$$\psi = \sum_{i=0}^{n} w_i s_i \Big/ \sum_{i=0}^{n} w_i \qquad (2\text{-}1)$$

The w_i terms in equation (2-1) are weight parameters that reflect "the importance of the stimulus with respect to the given dimension of judgment" (Anderson, 1981a, p. 62). They are assumed to be constant for the stimuli, in any given set of stimuli. The weighted averaging model also assumes that the weights are independent of the scale values (s_i) and that these latter are independent of context. In other words, the

scale value associated with a given stimulus remains the same whatever the context in which it occurs. This, of course, is the antithesis of Asch's (1946) position.

Some characteristics of this model are worth mentionning. Thus, despite the constancy of the weight parameters and the scale values, the structural form of the model implies that the effect of any stimulus depends on what other stimuli are selected for processing. Rewriting equation (2-1) as

$$\Psi = \frac{w_0}{\Sigma w_i} s_0 + \frac{w_1}{\Sigma w_i} s_1 + \ldots + \frac{w_n}{\Sigma w_i} s_n \qquad (2\text{-}2)$$

it can be seen that the relative weights associated with the scale values incorporate elemental (w_i) and aggregate (Σw_i) information. This characteristic confers to the model an inherent configural property.

Also, the model allows for an initial state parameter, s_0, which represents the individual's prior evaluation (or impression) before exposure to the stimuli. Besides its theoretical relevance, the initial state postulate is useful to explain the so-called set-size effect. This refers to the empirical finding that more extreme judgments may be obtained as more information with the same scale value is added; an apparent conflicting result with averaging processes. It is easy to show that there cannot possibly be a set-size effect predicted by the weighted averaging model unless there is an initial evaluation, i.e. unless $w_0 \neq 0$ (see Anderson, 1981a, p. 131).

Experimental procedure and tests

The Asch research procedure was to give subjects a list of trait adjectives from which they had to form an impression of a fictitious person. The procedure employed to test the weighted averaging model is similar, though more structured. It basically follows a within-subjects factorial analysis of variance scheme, where the levels of the factors that comprise the design are adjectives chosen according to their normative likableness values. The adjectives are often taken from a list compiled by Anderson (1968) which gives the mean likableness ratings of 555 trait adjectives (see also Appendix B in Anderson, 1981a).

Typically, subjects are presented with all factorial combinations of the traits. Their task consists in imagining for each combination a stimulus person characterized by the traits and to express their liking of that person on a rating scale. Subjects might be asked to repeat that task a few times to permit an individual analysis. The instructions they receive are often intended to make sure that the different assumptions of the model are respected. For example, they might be told to attribute the traits to differents sources who know the stimulus person, so as to minimize stimulus interaction (Anderson, 1974).

Anderson (1974, 1981a) has shown that, provided that there is equal weighting within each factor of the design, the averaging model predicts that the data will exhibit parallelism. To ensure equal weighting, subjects are explicitly instructed to consider that each trait adjective has the same importance. The test for parallelism is equivalent to a test of no interaction in repeated measures analysis of variance. Anderson (1974, 1981a) has argued that the nonrejection of

the parallelism hypothesis validates the model and also the linearity of the rating scale, a necessary requirement for parallelism to hold under the weighted averaging model. If nonparallelism is observed, it may be due to interacting stimuli, differential weighting, model mispecification, nonlinearity of the response function, or any combination of these possible explanations (Birnbaum, 1974, 1982; Lynch, 1985).

Empirical evidence

The early research reported by Anderson (1962) still provides an interesting demonstration of the application of information integration theory to person evaluation. The factorial design used in this study was a 3 x 3 x 3, where the levels of each factor corresponded to low (e.g. ungrateful), medium (e.g. unsophisticated) and high (e.g. level-headed) value adjectives. Twelve subjects followed the standard experimental instructions and rated the likableness of all twenty-seven profiles on a twenty-point numerical scale. The group results are plotted in Figure 2-2. The data show very small deviations from perfect parallelism, which is evidence for summative algebraic processes. Individual analyses also supported the summative model since statistically significant interactions were found with only three subjects and the variance explained by the interactions was small in all three cases.

The Anderson (1962) study was the first in an impressive research program on impression formation that used information integration theory as its basic conceptual structure and the weighted averaging model as its most fundamental statement about cognitive processes. The issues that were investigated are numerous: adding versus averaging (Anderson,

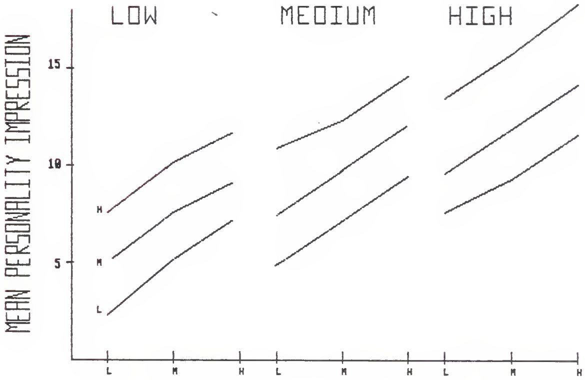

Figure 2-2. Group Results in Anderson's (1962) Person Evaluation Study.

1965a; Hendrick, 1968; Wyer, 1974), the set-size effect (Anderson, 1967), differential weighting (Birnbaum, Wong and Wong, 1976; Oden and Anderson, 1971), serial integration (Anderson, 1965b) and context effects (Anderson, 1971; Kaplan, 1971). These and other related studies are reviewed in considerable detail by Anderson (1974, 1981a) and Wyer (1974; Wyer and Carlston, 1979). In general, one can say that information integration theory and the weighted-averaging model have been highly successful in explaining the outcomes of the factorial design impression formation experiments.

Attitude Formation and Expectancy-Value Theory

Anderson's (1981a) information integration theory aspires to being a general, unified theory of human cognitive functioning. Hence, it has been applied to numerous domains of psychology, including attitude theory (see e.g. Anderson, 1981b). Attitude theory is a broad field of study directly related to evaluative judgment making and where the algebraic model orientation has been quite prevalent. However, the influence of information integration theory on this research area has been relatively minor compared to that of expectancy-value theory.

The conceptual structure underlying expectancy-value theory is not as well delineated as that of information integration theory, since it finds its roots in the work of many theorists (e.g. Atkinson, 1957; Edwards, 1954; MacCorquodale and Meehl, 1953; Rotter, 1954; Tolman, 1955). However, it provides an overall framework within which the relationship of actions to expectations, their psychological determinants, has been examined (Atkinson, 1982). The fundamental statement of expectancy-value theory is that people anticipate and judge the value of

the outcomes associated with their acts. The strength of their behavioral tendencies is a direct, multiplicative function of these expectancies and values. One of the earliest and clearest mathematical formulations of expectancy-value theory is Edward's (1954) subjective expected utility model, which is symbolically represented as:

$$SEU = \sum_{i=1}^{n} P_i U_i \qquad (2\text{-}3)$$

In the context of decision theory it is assumed that people will choose the alternative with the maximum subjective expected utility (SEU). As equation (2-3) shows, SEU is represented as a summation over n outcomes of P_i times U_i, where P_i is the individual's subjective probability that the alternative will lead to outcome i and U_i is the subjective utility of outcome i. Although there are conceptual and operational differences accross the perspectives in which expectancy-value theory has been applied (see Feather, 1982a), the SEU model probably captures the essentials of the approach.

The influence of expectancy-value theory on attitude research has been tremendous, most notably because of the work of Milton Rosenberg (1956) and Martin Fishbein (1963). While their conceptions of attitude show strong similarities, the rationale they use for arriving at their theoretical position is not the same. For Rosenberg (1956), the individual's behavior is motivated by the attainment of certain valued states, and he develops expectancies as to the capacity of any given attitude object to attain or block the realization of these states. He sees an attitude as a relatively stable affective response to an object and operationally "as a function of the algebraic sum of the products

obtained by multiplying the rated importance of each value associated with that object by the rated potency of the object for achieving or blocking the realization of that value" (Rosenberg, 1956, p. 368).

Whereas Rosenberg's (1956) approach has a definite motivational flavor, the context in which Fishbein (1963) proposes his expectancy-value version of attitude is that of learning theory. His argument runs as follows. For any given attitude object, a person can make associative relations with various attributes. These subjective relations are called beliefs and the totality of the individual's beliefs forms a belief system. Each of the attributes is itself assumed to elicit an implicit evaluative response, which is equivalent to an attitude. By pairing the attributes and the attitude object, the latter comes to elicit an overall evaluation which is conceived of as the summation of the evaluative responses associated with the attributes. In a symbolic form, the theory is expressed by the following well-known equation (Fishbein and Ajzen, 1975, p. 29):

$$A_0 = \sum_{i=1}^{n} b_i e_i \qquad (2\text{-}4)$$

where A_0 stands for the attitude or overall evaluative response toward the object, b_i is the subjective probability of association between the object and the i^{th} attribute, and e_i is the implicit evaluation of the i^{th} attribute.

It is worth noting that the Rosenberg (1956) and Fishbein (1963) proposals exemplify the algebraic model approach to evaluation (see Figure 2-1). In both cases the individual selectively attends to

certain internal or external stimuli from which psychological values are generated. The selection process is made clearer in Fishbein (1963) who argues that only a small number of beliefs, which he calls salient beliefs, are determinants of one's attitude at any given moment.[1] Whether they are called beliefs and evaluations, or perceived instrumentalities and value importances, these values correspond to psychological referents that are integrated to compose the evaluative response. Again, a specific algebraic rule is offered as the representation of the integration process.

Empirical evidence

Contrary to the experimental procedure of information integration theory, the context in which the expectancy-value attitude model is tested is usually correlational (but see Lutz, 1975). Typically, a list of modal salient beliefs concerning a target attitude object is constructed. Then, measures of the model's components are obtained in a sample of respondents and the correlation between a direct measure of attitude toward the object and the model's predicted score is computed. A high and statistically significant correlation is interpreted as evidence for the model's validity.

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1 Note that "at any given moment" implies that an attitude may be a function of certain salient beliefs at one time and of other, perhaps different, salient beliefs at another time (see Fishbein and Ajzen, 1975, p. 218). It also implies that the evaluative response that is experienced at any given moment is the result of the integration process described by equation (2-4). Thus, the Fishbein (1963) additive rule is more than a simple mathematical device that mimics the process of attitude acquisition through classical conditioning, which may take quite some time; it is a representation of cognitive functioning prior to evaluation, just like the weighted-averaging model.

A Fishbein (1963) study is representative of the testing procedure. The study was concerned with attitude toward Negroes. Fishbein (1963) first obtained a list of the ten most frequently elicited attributes of Negroes from a preliminary group of subjects. Then another sample of respondents provided the measures of associative beliefs (e.g. Negroes are lazy) and evaluations of the attributes. The correlation between the score obtained by applying equation (2-4) and a direct measure of attitude toward Negroes was 0.80.

Such high correlations are not rare in empirical studies designed to test expectancy-value attitude models. There is considerable correlational support for the Fishbein (1963) model and for other similar additive formulations in many areas of investigation (see Fishbein and Ajzen, 1975). Whether this reflects the validity of the model as a description of the actual cognitive processes that take place prior to evaluation is far from evident. Improper (equal weight or random) linear models have been shown to perform as well as models constructed from subjects' judgments in many studies (Dawes, 1979). According to Dawes and Corrigan (1974), "the whole trick is to know what variables to look at and then know how to add" (p. 105). Anderson (1982; Anderson and Shanteau, 1977) has been critical of the use of correlations to assess the validity of linear models. He gives many examples of very strong correlations that could be used as evidence for additive linear models in cases where it is known that there is interaction in the data.

Conclusions

This presentation of the algebraic model approach to evaluation has focused on two important research programs in psychology. Their influence on theory and research concerning the processes that account for evaluative judgments cannot be overstated. While they are both representative of the general approach outlined in Figure 2-1, they also portray contrasting research perspectives. Borrowing Katz and Stotland's (1959) characterization of the ways psychological problems can be attacked, it can be said that one is weak in content, strong in method while the other is strong in content but weak in method. Thus the model testing procedures of information integration theory are elegant, highly sophisticated and admittedly superior to correlational methods (Anderson, 1982; Lynch, 1985), but the theoretical structure has essentially taken form through experimental analysis (between 1959 and 1965), which is not comparable to the richness, maturity, and wide applicability of the expectancy-value framework (Feather, 1982b).

Evaluative Judgment Making and Consumer Research

Evaluation has been a major topic of research in marketing and consumer behavior. A recent review (Hegelson et al., 1984) of the 1950-1981 entire consumer research literature shows that attitudes get the highest percent of consumer behavior articles, that is over twelve hundred published reports in thirty years. Another revealing figure in Hegelson et al. (1984) is that an additional approximately two hundred articles deal uniquely with expectancy-value models. These data attest to the preoccupation of the field with evaluative judgment making issues and the profound influence of the algebraic model approach in this area.

This section of the chapter presents the consumer research perspective on evaluation. The central idea that is conveyed is again that algebraic models have played a prominent role in theory and research. In order to better understand why, it seems useful to distinguish two basic orientations of consumer research (a similar distinction is made by Cohen and Ahtola, 1971).

Historically, the interest in consumer research came from marketing considerations. The necessity of looking at the determinants of consumer behavior was clearly implied by the widely adopted marketing concept which maintained that marketing strategies had to be defined by taking into account consumers' needs. Much of current consumer behavior research is still aimed at providing valuable knowledge to marketing management. This reflects the marketing orientation of consumer research. Over the years, however, a different orientation has emerged; that of considering consumer behavior as a distinct field of study, without necessarily gearing its knowledge production toward the requirements of marketing management. For convenience, this will be referred to as the consumer behavior orientation.

The distinction appears useful for two reasons. First, it provides a general framework for examining the evaluative judgment making literature in consumer research. It will be argued that because of their different goals, these orientations have given rise to fairly separate research approaches and emphases. A summary of these differences, as they relate to the study of consumer evaluative judgment making, is presented in Table 2-1. Second, the distinction suggests that the prominence of algebraic formulations of evaluative processes

Table 2-1

Evaluative Judgment Making and
Consumer Research's Two Basic Orientations

	Marketing Orientation	Consumer Behavior Orientation
Principal Concerns and Motivations	. Understanding for Managerial Utility	. General Understanding
Schools of Thought	. Mathematical Psychology . Statistics . Psychometrics	. Social Psychology
Major Approaches	. Multiattribute Modeling . Conjoint Analysis . Perceptual Mapping . Preference Regression	. Expectancy-Value
Research Emphases	. Estimation . Reliability . Prediction . Biases	. Conceptual Issues . Measurement . Validity

in consumer research might be explained by two factors: the mathematical rigor imposed on decisional research (marketing orientation) and the natural borrowing and adaptation of psychology's concepts and theories (consumer behavior orientation).

Motivations

The marketing context is one of competition between brands or products. Some of the ultimate measures of competitive effectiveness include market share, sales volume, and purchase rates. These are indicators of consumers' preferences for the market alternatives. Marketing decisions must be based on management's knowledge of the factors that affect consumers' evaluations of market offerings. The implications for the identification of market opportunities and the application of corrective marketing actions are obvious. Within that context, the role of consumer evaluative judgment making research is to provide models of preference structure in order to give management general guidelines concerning the measurement of the determinants of brand evaluations and the possible influence strategies that can be employed to alter these evaluations (Aaker and Myers, 1982). These preference models can also be used in concept testing, product design and brand positioning, and market segmentation (Shocker and Srinivasan, 1979; Urban and Hauser, 1980).

The consumer behavior orientation offers a contrasting perspective. Here, the interest lies in understanding the processes that characterize evaluative judgment making in the marketing environment. The consumer is seen as an individual who often makes evaluations of objects in a particular context; that of the marketplace. This does not

nessarily mean that marketing implications are totally excluded, but it certainly means that such practical implications are not the fundamental research motivations.

The orientations' goals are evidently not the same; while one has a definite focus on managerial implications, the other is driven by general interest in understanding the process of consumer evaluative judgment making.

Marketing Preference Structure Models

Over the years, a number of mathematical models have been proposed by marketing researchers to assess the preference structure of consumers. These models are all issued of the general notion that preference, or evaluation, is a function of the perceived physical or symbolic characteristics of products. Their relative value is usually judged through considerations that relate to cost of implementation, predictive power, application constraints or type of product (Urban and Hauser, 1980). Four such models are presented here. The discussion is voluntarily brief since their users and proponents rarely make direct links between cognitive processes and the algebraic rules that define the models. However, the similarities with the algebraic model approach, in terms of testing procedures and overall conception, are sometimes so manifest that it is conceivable that representational issues may be simply left out for lack of interest, perceived irrelevance, or convenience.

Multiattribute modeling

Wilkie and Pessemier (1973) define the multiattribute attitude model as follows (p. 429):

$$A_{jk} = \sum_{i=1}^{n} I_{ik}B_{ijk} \tag{2-5}$$

where A_{jk} is consumer k's attitude score for brand j, I_{ik} is the importance weight given to attribute i by consumer k, and B_{ijk} is consumer k's belief as to the extent to which attribute i is offered by brand j.

The model provides an interesting illustration of the impact of consumer research orientation on model selection. The similitude with the Fishbein (1963) and Rosenberg (1959) proposals appears immediately. Indeed some marketing authors refer to this model as the expectancy-value model of attitude structure (e.g. Lilien and Kotler, 1983; Urban and Hauser, 1980). However, researchers who tend to be characterized by a consumer behavior orientation have argued that, its structural form aside, the multiattribute model does not qualify for an expectancy-value categorization and have rejected it on conceptual grounds (Ajzen and Fishbein, 1980; Cohen, Fishbein and Ahtola, 1972). Yet, the model's predictive power is good, often better than traditional expectancy-value models (Mazis, Ahtola and Klippel, 1975). It is not surprising then that it is so popular among marketing researchers (Wilkie and Pessemier, 1973).

Preference regression

A popular method of assessing the structure of consumer preference is to modify the multiattribute framework such that the weights are not directly stated by consumers but rather estimated by monotonic or

metric regression. The marketing rationale for this practice is clear. Marketing researchers are interested in predictive validity; they want a model that reproduces preferences in the best possible way. Self-estimated weights reflect consumers' opinions about the importance they give to the brand's attributes. They might not be comparable to the optimal weights obtained by regression analysis. In a perspective of actionability of a brand's attributes, marketing researchers seem to think that it is preferable to place their confidence in accuracy and reliability rather than in consumers' beliefs. Many researchers think that these beliefs are subject to strong biases due to halo effects (Beckwith and Lehman, 1975, 1976; Holbrook, 1983).

Conjoint analysis

Conjoint analysis is similar in spirit to the methods of information integration theory in that, contrary to expectancy-value and multiattribute approaches, the algebraic model's parameters are not estimated directly. Rather, consumers provide evaluations of profiles defined by a factorial arrangement and the parameters are chosen such that the fit between observed and reproduced evaluations is best, with the constraint of an additive combination rule. Wilkie and Pessemier (1973) use the term decompositional to describe this indirect estimation approach.

In its simplest form, the method is identical to within-subjects analysis of variance, where estimated main effects are called utilities or part-worths. There are, however, numerous possible variations in terms of model complexity, data collection techniques, measurement and estimation procedures (Green and Srinivasan, 1978).

Conjoint analysis is probably the best example of the marketing orientation of consumer research in the area of evaluative judgment making. First, its managerial relevance is unequivocal. Myers, Greyser and Massy (1979) refer to it as "one of the most successful types of new knowledge introduced . . . of direct use and benefit to line marketing managers and marketing decision-making" (p. 25). A recent survey by Cattin and Wittink (1982) estimates that there have been approximately a thousand commercial applications of conjoint analysis during the 1970s. The methodology has indeed found many sectors of application in marketing, including concept evaluation (Shocker and Srinivasan, 1979), product optimization (Green, Carroll and Goldberg, 1981), and market segmentation (d'Astous and Rigaux-Bricmont, 1983; Green and DeSarbo, 1979).

A second observation is that conjoint analysis is not theoretically grounded in the behavioral sciences. Its origins go back to fundamental measurement issues (Luce and Tukey, 1964; Tversky, 1967) and, as such, its connection to evaluative cognitive processes is at best superficial. Finally, the conjoint analysis literature in marketing shows a strong emphasis on methodological as opposed to conceptual issues. Thus, researchers have been primarily interested in estimation (Jain et al., 1979; Leigh, MacKay and Summers, 1984; Wittink and Cattin, 1981), prediction (Akaah and Korgaonkar, 1983; Srinivasan, Jain and Malhotra, 1983; Wittink and Montgomery, 1979) and reliability (Malhotra, 1982; McCullough and Best, 1979; Segal, 1982).

Perceptual mapping

Perceptual mapping techniques have two basic goals: (1) to identify the few cognitive dimensions underlying consumers' evaluations of brands or products and (2) to position these brands or products with respect to the identified dimensions (Hauser and Koppelman, 1979). To meet these goals, an impressive array of analytical tools have been proposed. For simplicity they can be divided into two groups: attribute-based and multidimensional scaling techniques.

Attribute-based perceptual mapping techniques start with consumers' ratings of brands on several attributes. The first step in the procedure is to reduce the dimensionality with the help of multivariate statistical techniques such as factor or discriminant analysis. The rationale for doing so is based on researchers' belief that "consumers tend to simplify judgments . . . to prevent cognitive strain and information overload" (Urban and Hauser, 1980, p. 193). The brands are then positioned in the reduced and interpreted space; their coordinates being used to predict preference.

Multidimensional scaling techniques are not constrained by an initial set of attributes. Rather, the dimensions may be derived from overall similarity data. In that case, the locations of the brands in the derived space are used for interpretation and subsequent analysis with preference data. In other models, such as classical multidimensional unfolding, the input data are not similarities but consumers' liking ratings of the brands. The resulting map is called a joint space, since it locates consumers and brands in the same low-dimensional space (see e.g. Dillon and Goldstein, 1984).

Perceptual mapping is another representative illustration of the marketing viewpoint in consumer evaluative judgment making. The techniques are essentially geared toward managerial use, principally in the area of product design and development (Johnson, 1977; Lilien and Kotler, 1983; Pessemier, 1982; Urban and Hauser, 1980; Wind, 1982). Their theoretical roots are found in mathematical psychology (e.g. Torgerson, 1958), psychometrics (e.g. Thurstone, 1947) and statistics (e.g. Fisher, 1936). Finally, major research issues include estimation (Hauser and Pekelman, 1979; Holbrook, Moore and Winer, 1982; Simmie, 1978), prediction (Huber, 1975; Moore, 1982; Moore and Holbrook, 1982) and reliability (Summers and MacKay, 1976).

The Expectancy-Value Research Tradition

In a recent article, Peter and Olson (1983) present an interesting analysis of the marketing of scientific theories; they basically draw analogies with the marketing of conventional consumer products. Thus theories are seen as scientific products with attributes (e.g. the theorist's reputation), distribution channels (e.g. conferences, journals), price (e.g. research expenditures) and promotional strategies (e.g. personal selling to journal editors). Applying their analysis to the case of evaluative judgment making within the consumer behavior perspective, one is inclined to say that expectancy-value theory has largely dominated the market for the last twenty-five years and is currently in the product life cycle stage of late maturity. Furthermore, a look at contemporary "catalogs" of consumer behavior theories indicates that the Fishbein (1963) model has been and still is the leading brand (see Assael, 1984; Engel and Blackwell, 1982; Kassarjian and Robertson,

1981; Robertson, Zielinski and Ward, 1984; Zaltman and Wallendorf, 1983).

This characterization is, despite its apparent semi-seriousness, a true depiction of the reality. Nowhere has the notion of abstract, deliberative, algebraic-like evaluative processing been more prevalent than in the consumer behavior attitude literature. Comprehensive reviews by Wilkie and Pessemier (1973) and Lutz and Bettman (1977) offer uncontestable testimony as to the major impact of the Fishbein (1963) and Rosenberg (1956) formulations on consumer researchers. One can conjecture that the reasons explaining this great popularity have to do with the wide acceptance of these models in the behavioral sciences in general, their relevance to marketing matters, their intuitive validity, and the expectation of high research payoffs.

Table 2-2 presents an attempt at encapsulating the abundant consumer behavior literature on evaluation in a life cycle framework. The algebraic model approach era has been partitioned into three time periods designated as introduction, growth and maturity stages. The main characteristics of each period are identified and corresponding representative studies or books are shown.

Introduction

The first studies to use an expectancy-value approach in a consumer research setting appeared in the late 1960s. The idea was new to marketing and the research opportunities multifarious. As in most situations of new theoretical development, the papers were principally exploratory and conceptual ambiguities were frequent. For instance, Hansen (1969) used Rosenberg's (1956) model in his experimental

Table 2-2

The Algebraic Model Era in Consumer Research

Stage	Characteristics	Representative Publications
Introduction (late 1960's, early 1970's)	. Few Articles and Incorrect Operationalizations	Hansen (1969), Sheth (1970)
	. Basic Versions and Exploration	Cohen and Ahtola (1971)
	. Simple Correlational Tests	
Growth (1970-1975)	. Focus on Model Specification and Predictive Ability	Bass and Wilkie (1973); Churchill (1972)
	. Critical Analyses	Cohen, Fishbein and Athola (1972)
	. New Features and Models	Green and Rao (1971,1972); Green and Wind (1973)
	. Integrative Papers	Cohen (1974); Mazis, Ahtola and Klippel (1975); Wilkie and Pessemier (1973)
	. Extensions	Ahtola (1975); Ryan and Bonfield (1975)
Maturity (1975-)	. More Elaborate Testing	Bettman, Capon and Lutz (1975a,b); Lutz (1975)
	. Implicit Acceptance	Engel and Blackwell (1982); Lutz and Bettman (1977); Robertson, Zielinski and Ward (1984)
	. Theoretical Support	Mitchell and Olson (1977, 1981); Olson and Dover (1978)
	. Limitations	Cohen (1982); Zajonc and Markus (1982)

investigation of consumer choice behavior. Not only did he incorrectly operationalize Rosenberg's (1956) value importance component, but he even tested if the score obtained by the algebraic model was a better predictor of choice than a direct measure of attitude. Such was the state-of-the-art in attitude theory at that time and only a few researchers (e.g. Cohen and Ahtola, 1971) expressed concerns about the inappropriateness of incorrect operationalizations.

Growth

By 1973, there had been more than forty published marketing applications of expectancy-value models (Wilkie and Pessemier, 1973) and the trend continued. Most of the studies dealt with technical issues such as the number of attributes (Wilkie and Weinreich, 1972) or the structural form of the model (Bass and Wilkie, 1973). Prediction was the ultimate criterion of success for a model and the substance of many studies was often reduced to comparing correlation coefficients.

With such a dramatic increase of research in this area, the field rapidly showed signs of reflective thinking on important issues. The well-known debate between orthodox militants (Cohen, Fishbein and Ahtola, 1972) and partisans of marketing adaptation (Bass, 1972; Sheth, 1972; Talarzyk, 1972) on the consequences of model modifications is a vibrant illustration. Also, important review and integrative papers that summed up the accumulated knowledge, identified major conceptual and methodological problems, and suggested directions for research were published (Cohen, 1974; Mazis, Ahtola and Klippel, 1975; Wilkie and Pessemier, 1973). This period corresponds to a similar period of growth for preference models. Conjoint measurement (Green and Rao, 1971) and

multidimensional scaling (Green, 1975) are often seen as direct competitors to the expectancy-value models.

The end of the growth period is characterized by conceptual extensions of the Fishbein (1963) model. Thus Ahtola (1975) proposes an expectancy-value model that distinguishes between two conceptions of expectancy found in the marketing literature; belief strength and belief content. Also, Fishbein's (1967b) behavioral intention prediction model with attitudinal and normative determinants becomes the new hot topic in consumer behavior attitude research (Ryan and Bonfield, 1975).

Maturity

After the excitement of the growth years, consumer researchers become more skeptical of correlational tests and the algebraic model is the focus of more elaborate testing. Thus the model's validity is examined through experimental manipulations of the belief and evaluation components (Lutz, 1975; Olson and Dover, 1976). Also, operationalization issues are considered within the context of experimentation (Bettman, Capon and Lutz, 1975a,b). These ingenious studies give strong support for the Fishbein (1963) formulation, which crystalizes its acceptance among consumer behavior researchers (Lutz and Bettman, 1977).

The situation now is one where no further testing seems warranted. The field gives the impression of having adopted the algebraic model approach to evaluation (Lutz, 1981). Current research using algebraic models does not focus on the model itself. Rather, the model is utilized as theoretical support for the examination of other marketing phenomena such as repetition (Mitchell and Olson, 1977), deceptive

advertising (Olson and Dover, 1978) or advertising effects (Mitchell and Olson, 1981). However, there are indications that the supremacy of the algebraic model may come to an end. Recent papers offer fresh perspectives on evaluative judgment making (Cohen, 1982; Zajonc and Markus, 1982). The next section of this chapter discusses some of these proposals.

Criticisms and Alternative Formulations

Hopefully the preceding discussion will have succeeded in demonstrating the prevalence of the algebraic model orientation in theory and research on evaluative judgment making, especially in the consumer behavior area. There is no doubt that the computational perspective serves for many as an accepted theoretical framework. This wide acceptance seems to be mainly attributable to two factors. First, the approach is conceptually appealing. The idea that people form evaluations of objects by considering relevant information and integrating it using some sort of rule-based cognitive mechanism is intuitively plausible and very much in line with current views in psychology that see man as a thinking, information processing organism. Second, the accumulated empirical support is considerable; repeated observations of parallelism and high correlations are taken as evidence for the appropriateness of using mathematical models to describe cognitive processes.

However, the algebraic model appears vulnerable in relation to these aspects. Critics have pointed out that the experimental contexts in which the models are tested are often conducive to algebraic cognitive processing. They argue that the tasks that subjects must perform not only do not correspond to typical situations where evaluative

judgments are made but, most importantly, bias the results in favor of concluding as to the occurrence of algebraic processes. The critics have also noted several ambiguities that question the empirical validity of the models. Some authors have criticized the algebraic model approach by calling into question even its most unattackable premises. Zajonc (1980, 1984), for instance, has challenged the common sense view of conceiving of affect as resulting from cognitive appraisal. He presents numerous empirical findings that can be explained without necessarily invoking a cognition-affect psychological sequence and where there is no clear way of finding how such a sequential process could possibly be occurring. Overall, the picture appears more blurry than that advocates of cognitive algebra have shown to the scientific community.

The Model and the Task

One recurring theme in the modern philosophy of science is the theory-ladenness of empirical facts (see Hunt, 1983; Kuhn, 1970; Zaltman, LeMasters and Heffring, 1982). Many authors believe that scientific theories cannot be empirically tested since the testing process (choosing variables, designing the experiment, making measurements, and so on) is itself confounded with the theoretical structure. The case of cognitive algebra provides a particularly good illustration of theoretical contamination of methodology.

Coming back again to Figure 2-1, it can be seen that the main characteristics of the algebraic model approach are sequentiality, discretization, and integration. That is, the theory says that to arrive at an evaluation, an individual evaluates selected discrete aspects of the object in sequence and then combines the psychological counterparts of

these aspects. Typically, great care is taken in designing a research setting that fits well this theoretical scenario. The approach is most evident in the choice of experimental stimuli. In most studies, whether the interest is in impression or attitude formation, the stimuli are verbal instead of visual. The obvious implication is that sequential and discrete processing is forced on the subject. Such would not be the case with pictorial stimuli for instance. Given the preponderance of visual stimuli in the environment, it is surprising to see the almost complete reliance on verbal material in evaluative judgment making research. One suspects that the nature of experimental stimuli is simply dictated by the algebraic conceptual framework.

In certain cases, in addition to the processing constraints posed by verbal stimuli, subjects are specifically instructed to treat the simultaneously presented informational units as separate (Anderson, 1974). In other cases, such as in the attitude formation studies, the task requires that, prior to the measure of overall evaluation, subjects rate object features separately on various scales, precluding almost totally any configural processing. Moreover, the scales being often numerical, the computational processing strategy is strongly suggested.

These observations render suspicious the empirical success of mathematical models of evaluation. They tend to imply that the experimental context is partly responsible for the good performance of these models. As Wyer and Carlston (1979) speculate, "the methodology may have actually created the phenomena the models are assumed to describe" (p. 314).

Specific Attacks on the Weighted Averaging Model

Even if methodological biases are disregarded, the status of the algebraic model is no less equivocal. Thus, the previously mentioned predictive power and robustness of linear models indicate that the correspondence between the structure and components of expectancy-value attitude models and actual cognitive processes is not automatically implied by high correlations. Anderson (1982) has argued that the methods of information integration theory are more adequate to test cognitive algebra models. But, some critics do not appear convinced by Anderson's (1982) arguments.

Wyer and Carlston (1979) for instance have been critical of the weighted averaging formulation. They have questioned its most basic assumptions; absence of context effects, independence of weights and scale values, and independence of valuation and integration processes. They have suggested for example that the averaging effect can be explained by subjects' limited processing capacity instead of averaging integration processing. The rationale is simply that, as more information becomes available, the number of inferential implications that subjects make probably decreases due to capacity constraints, which reduce the importance of marginal information and produce the averaging effect.

In addition, Wyer and Carlston (1979) have argued for the necessity of getting independent prior estimates of the model's weight parameters and not relying only on a posteriori inferences based on experimental results. They maintain that, without such estimates, one cannot distinguish between interpreting the weights as corresponding to

psychological entities determined prior to the integration phase (see Anderson, 1981a, p. 5), and a process interpretation. That is, it is possible to think that subjects undertake the evaluative judgment task by selecting first the informational units with the most extreme implications. Once a tentative judgment is made, subjects might consider other information with less extreme implications, modify the judgment, proceed again with the selection process, and so on. Seen from this angle, differential weighting does not result from a prior valuation process but is incidental to integration itself.

Another critique that has been raised against the weighted averaging model and the information integration paradigm in general concerns the assumption that the judgment is based uniquely on presented information. Some authors (Cohen, Miniard and Dickson, 1980; Fishbein and Ajzen, 1975) have advanced the proposition that subjects may engage in inferential processing during the evaluation task. The resulting judgment would then be a function of presented and inferred information. Cohen, Miniard and Dickson (1980) show how inferential belief formation may explain some of the results of the crucial tests designed to discriminate between the adding and averaging rules (e.g. Huber and McCann, 1982; Troutman and Shanteau, 1976).

Alternative Views

The major conceptual criticism to the algebraic model approach is probably its restriction to a compositional perspective of evaluative judgment making. Somehow, it seems a little senseless to think that each time an object is encountered and that an evaluation is necessitated, the individual will internally compute an evaluative reaction.

For one thing, this would be particularly inefficient if the object had already been evaluated previously. A reasonable alternative processing strategy would be in such a case to simply retrieve the previous judgment from memory and use it (Lingle and Ostrom, 1981; Wright, 1975, 1976).

This idea is undoubtedly not new and may have possibly been ignored by proponents of algebraic models of evaluation because of its evidence. Interestingly, Fishbein's (1967a) earlier writings were consistent with this interpretation. He proposed his learning theory of the formation of an attitude toward a concept and suggested that "when the concept is presented, it will elicit this summative evaluative response, that is, it will elicit this learned attitude" (p. 394). This affect-retrieval mechanism is even directly derivable from Fishbein's (1963) learning theory since it is assumed that each of the attributes (concepts) that lead to the formation of the individual's salient beliefs elicits an evaluative response.

Some convincing empirical evidence that people can store in memory affective reactions, feelings and emotions comes from Bower's (1981; Bower and Cohen, 1982) research program on mood and memory. He has shown that the typical effect of context on memory performance--that is, memory is enhanced when the environmental context of the test is identical to that prevailing during encoding (e.g. Smith, Glenberg and Bjork, 1978)--generalizes to the case where context is mood. Thus subjects have higher recall scores when their hypnotically induced mood state (anger, sadness, happiness) is the same at the encoding and retrieval

stages (Bower, Monteiro and Gilligan, 1978). Bower and Cohen's (1982) theoretical account for these results is that emotions are recorded in memory just like other cognitive events. As a result, they can be activated in a manner analogous to that postulated by memory network theorists (e.g. Anderson, 1983). Activating the encoding mood state at test time leads to better memory since it also activates numerous associative retrieval paths.

The possibility of affect being stored in memory has interesting theoretical implications. Consider for instance the case of the mere exposure effect. Moreland and Zajonc (1977, 1979) have shown that repeated exposures of certain unfamiliar stimuli increase rated attractiveness without necessarily increasing familiarity. One speculative explanation for these results is as follows. First, since it has been shown that people access positive material in memory more easily (Fiske and Taylor, 1984), one can assume that a majority of concepts in one's mind are loaded with positive affect. If this is the case, then the probability of instantiating positive cognitive structures to give meaning to the unfamiliar stimuli is high. During this search for meaning, positive affect would eventually be transferred to the stimuli. The more presentations there are, the more positive affect would be transferred. However, after a certain number of presentations no new cognitive structures would be instantiated and no more affect transferred. One would then expect the relationship between amount of affect and number of exposures to peak, a result that is typical of mere exposure research (Zajonc, 1968). This scenario predicts an increase in liking

but not in familiarity since a great number of cognitive structures would have tentatively been used to understand the stimuli.[1]

Lingle and Ostrom (1979) report the results of a study that gives credence to the affect-retrieval thesis. Subjects were asked to evaluate the suitability of a stimulus person for a given occupation using certain descriptive characteristics. After this initial evaluative judgment, they were shown another occupation and asked if the person was suitable for it. Subjects' mean response time for the second judgment was faster if the occupation required similar abilities as the first one than if it required different abilities. The authors conclude that these results demonstrate that in the similar abilities condition, subjects based their second judgment partly or totally on the first judgment, without necessarily reviewing the descriptive information about the stimulus person. Presumably, in the dissimilar abilities condition the relevance of the previous evaluative judgment was minimal. Thus, as Lingle and Ostrom (1979) speculate, subjects might have used an algebraic-like processing strategy to produce the second suitability judgment. This would have taken more time as the empirical results suggest.

There is an interesting extension of this notion of transfer of affect upon re-encounter of evaluation objects. It follows from the realization that any stimulus object that an individual may come upon at a given moment must be recognized. That is, if this is a re-encounter,

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1 One way of testing this conceptualization would be to use subjects having greater potential for the instantiation of negative concepts, such as highly depressed individuals. The prediction is that repeated exposures of unfamiliar stimuli would then decrease liking.

the individual must have somehow decided that it is in fact an object that is known and must categorize it as such. Once it has been associated with an internal representation having affective qualities, then the evaluative reaction generalizes automatically. The more fascinating case, however, is one where the object is novel. The individual might then attempt to place it in a mental category in which no one-to-one memory representation of the object yet exists. If the category possesses affective qualities, an efficient evaluation strategy would be to transfer them to the novel object.

Fiske (1982) has recently proposed a similar version of evaluative processes in the area of interpersonal relations. She argues that people possess organized cognitive structures called schemas. Once an object fits a given schema, the affect that is presumably linked to the schema is transferred to the object. She reports the results of an experiment designed to test these ideas. Undergraduate female subjects completed a seventeen-trait personality inventory for themselves, their best friend and a person with whom they once had or were having a romantic relationship. They also rated several photographs of males on a scale measuring the extent to which they physically corresponded to their "type of guy." Later in the experiment, they were asked to rate a stimulus person on fifteen affective scales. The experimenter provided subjects with a photograph and a personality profile of the stimulus person that either matched subjects' type of guy and/or romantic partner profile or not. The results of this study show that more positive affect was obtained when there was a match than when there was not. According to Fiske (1982), the "most straightforward explanation seems to

be that when a new person is a good match to one's prior category, the person elicits the affects and actions linked to the schema" (p. 65).

Unfortunately, the Fiske (1982) results are not incompatible with an algebraic model interpretation; there is nothing in this experiment that implies that subjects did not go through the process of building up an evaluation on the basis of the stimulus person's features, just as the computational perspective assumes. Also, even though the author mentions that subjects were not suspicious, demand characteristics remain a plausible explanation. At least, retrospective comments on subjects' processing strategies should have been collected. Finally, the schema-triggered affect proposal is intimately linked to categorization processes, but the author is quite evasive on the subject. Yet, the the analysis of category-based evaluative judgment making must pass by the comprehension of basic categorization processes.

A more precise theoretical statement on category-based evaluation has been advanced by Cohen (1982). He also questioned the validity of the many rule-based conceptualizations of attitude formation. Drawing from recent work in cognitive psychology, notably that of Brooks (1978) and Medin and Schaffer (1978), Cohen (1982) put forward the idea that attitude formation could under certain circumstances be conceived of as resulting from intuitive, nonanalytic cognitive processes, namely the similarity matching of the attitude object with one or a small number of exemplars stored in memory and the automatic transfer of the affect associated with the exemplar(s) to the attitude object. Abelson's (1976) colorful account of a hypothetical faculty admissions committee member judging the likely success of an applicant by retrieving a single

memory instance: "Mr. Kolodny reminds me very much of Paul Pippik, who hung around for eight years never writing his dissertation. Let's not get into that again" (p. 37), exemplifies the reasoning behind the notion of exemplar-based processing.

Very little research has been done on the occurrence of such processes. Gilovich (1981) reports the results of two interesting field experiments which show that exemplar-based processes may play an important role in judgment making. Sportwriters and football coaches were asked to rate five hypothetical college football players for their potential as professionals (experiment 1). In three experimental conditions a relevant association to a current professional player was made available, viz. Tim B.'s rating by a large scouting organization is three on their five-point scale, the same rating given to X (the relevant association) when he was a college senior, or Tim B. won the X award as the school's most outstanding player, or Tim B. and X come from the same hometown. In the control conditions the associations were irrelevant, i.e. the college football player and the professional did not play the same position. Subjects rated the relevant association profiles higher than the control profiles and the differences were statistically significant, except for the award condition. This strongly suggests that subjects' ratings were influenced by the availability of a relevant exemplar (much like in Abelson's example); presumably subjects transferred some of their affect for the current professional player to the college football player. However, though Gilovich's (1981) results are provocative, the lack of control over subjects' knowledge of and feelings toward the associations as well as the experimental task itself

(questionnaires were mailed) precludes any firm conclusions about the actual cognitive processes that took place during the judgment episode.

The study of categorization processes in attitude formation appears to be highly commendable as an area of investigation. As mentioned previously, with a few exceptions (Cohen, 1982; Cohen, Miniard and Dickson, 1980) consumer researchers have somewhat blindly adopted the computational view of an evaluative response, without worrying too much about the conditions under which this theory would or would not hold. There have been proposals that show some concern about the possibility of environmental constraints (amount of information, distractions, time pressures) limiting consumers' ability to implement given rules (Wright, 1974; 1975), but these have taken the position that other, simpler rules would be used. Curiously, the position that comes closest to Cohen's (1982) ideas has been associated with researchers exhibiting only a shallow interest in consumers' cognitive processes; those advocating the use of multidimensional scaling and other perceptual mapping techniques to predict aggregate responses to new products and services (see particularly Stefflre, 1965; 1968). In the next chapter, the factors that encourage the use of algebraic-like or exemplar-based processes in evaluative judgment making are discussed and some specific research propositions are presented.

CHAPTER THREE
EVALUATION AND CATEGORIZATION

Researchers concerned with how people develop feelings toward objects have been disinterested in the issue of how these objects come to acquire meaning. One notable exception is found in the work of Osgood, Suci and Tannenbaum (1957). For these investigators, there is an inherent evaluative dimension of meaning attached to concepts in general; evaluation is automatically implied in the understanding process. Unfortunately, the major impact of Osgood, Suci and Tannenbaum's (1957) work seems to have been in the area of attitude measurement. As the preceding chapter shows, the most popular perspective on evaluative judgment making has been the algebraic characterization and it does not directly deal with the process of object understanding. Within this perspective, one must assume that it is either antecedent to evaluation, parallel but independent or simply confounded with evaluation processes.

Likewise, the literature on the representation and formation of concepts is practically devoid of references to affective reactions. It is generally agreed that concepts play an important role in understanding; they provide a basis for object classification and inferential processing. That is, when an object is encountered, it is experienced as a member of a category. This categorization process is likely to result in making available a host of possible implications concerning the properties of the object. Yet, though it is but a small theoretical

extension to hypothesize that affect can be one of the inferred properties, theory and research on categorization processes have usually focused on cold cognitions.

A categorization approach to evaluation offers a contrasting alternative to algebraic processes. Rather than conceiving of affect as resulting from computational-like cognitive operations on a subset of the object's attributes, it assumes that an overall affective response already exists at the level of the category and that the processes that lead to the assignation of the object to a conceptual category also lead to its evaluation. One advantage of category-based evaluation is related to judgment time. Since presumably the transfer of affect from the category to the object follows immediately upon recognition, an evaluative reaction is readily available. This is less evident in the context of an algebraic formulation. For instance, Anderson's (1981a) information integration theory stipulates that before the mathematical integration rule is applied to obtain the evaluative judgment, selected features of the stimuli must go through a process of valuation which consists of generating for each feature a weight and a scale value. This three-step (selection, valuation, integration) conceptualization may not have the flexibility required to explain how quick, first impressions are produced.

This chapter articulates a conceptualization of evaluative judgment making that attemps to reconcile the analytic perspective of algebraic models with the intuitive approach of category-based evaluation. The chapter starts with an overview of the recent developments in research on categorization processes. Then, the proposed categorization

approach is developed. Finally, some general research propositions are presented.

Recent Developments in Categorization Research

There is quite a voluminous amount of theorizing and research in cognitive psychology that has been concerned with explaining how people arrive at simple categorization judgments such as a penguin is a bird, a chair is a type of furniture or a whale is a mammal. Researchers working in this area of psychological research share the conviction that an understanding of such categorization processes will bring a great deal of information on the nature of human thought. The reason is that the classification of stimulus objects into existing mental categories constitutes an effective way of dealing with the complexities of the environment and one that is omnipresent in mental functioning. Knowledge of an object's category status renders available a lot of information already stored in memory, facilitates the creation of expectations and, consequently, contributes to an efficient perceptual interaction.

Research in this area has concentrated on three interlocked aspects of conceptual categories; their acquisition, representation and the implications at the level of categorization strategies. The interlocking can be seen in noting that the manner by which a concept is acquired will surely dictate the nature of its representation in memory. For example, an individual being given a verbal description of a concept will probably form a different representation than if one typical instance of the concept is visually presented or if several instances are shown. In the first case, the individual may come up with a mental list of defining attributes. In the second case, a unique image of the

concept is likely to be stored in memory. In the last case, the person may store image representations of all instances or a subset of them (e.g. the most typical); he might even create a new representation that summarizes the information conveyed by the instances. The representation format will in turn influence how the individual attacks the problem of judging the category membership of a new instance. A strategy of verification that some or all of the defining features are found in the novel object seems appropriate if a mental list representation is adopted. On the other hand, the existence of memory exemplars and, perhaps, a summary description of the concept might rather suggest an overall similarity strategy. That is, the object might be categorized as an instance of the concept if it looks sufficiently like the exemplars or the summary representation.

The conditional dependence of acquisition, representation and categorization extends to research procedures. Thus in general researchers have the control over the acquisition context; they make decisions concerning the nature of the stimuli, presentation format, quantity of information, learning time, and so on. The most relevant empirical data come from the categorization task. It should be noted that it is on the basis of both the categorization results and the assumptions about the consequences of adopting a particular acquisition context that inferences about memory representation can be made.

It is easy to see that such a research context is prone to the same kind of methodological contamination that has plagued the evaluation research literature for years. That is, researchers might develop

theories of concept representation and categorization processes that are contingent upon well-defined acquisition scenarios. Indeed, recent reviews of the literature on categorization have been highly critical of the traditional conceptions of the structure of categories (Lingle, Altom and Medin, 1984; Medin and Smith, 1984; Smith and Medin, 1981). For some authors (e.g. Brooks, 1978), the direction taken by much of the concept formation research has narrowly focused on experimental tasks that fit well the traditional views.

Features and Rules

Perhaps one of the best examples of what Smith and Medin (1981), in their excellent assessment of the concept literature, have called the classical view, is offered by Bourne (1974; Bourne, Dominowski and Loftus, 1979). He posits that a concept is an abstraction that is entirely defined by a set of attributes and a rule. In his notation,

$$C = R\ (x, y, \ldots)$$

where C stands for the concept, R the rule, and (x, y, ...) the attributes. For instance, the concept of a house can be thought of as a conjunction (R) of many features such as roof, doors, windows, etc. It is also possible to see it as a disjunction (another rule) of features; it can have a hip or flat roof, one or two floors, wooden or brick walls, etc. According to Bourne (1974), this definition of a concept "divides the universe of objects, events, processes, and states of affairs into two categories--positive instances, that is, stimuli which are consistent with the concept description, and negative instances, that is, stimuli which are inconsistent with the concept description" (p. 232).

The Bourne (1974) formulation is abstract in the sense that it leaves no place for memory representations of particular instances of the concept (e.g. a neighbor's house). Of course, this theoretical position can not and does not disavow the existence of such memories; it simply assumes that they are not part of the concept or, implicitly, that they play no functional role in categorization. Since, as argued earlier, the representation issue is linked to the acquisition process, one would expect that the experimental procedures that are devised to simulate the formation of concepts within this framework will tend to incite subjects to focus on the abstraction of regularities from the stimuli. Indeed, the typical concept attainment task is really a problem solving game. Subjects are shown stimuli that either belong or do not belong to a to-be-discovered concept. They arrive at a solution through a process of iterative hypothesis testing; that is, upon presentation they categorize each stimulus as being a member or not of the concept and receive immediate feedback on the correctness of their classification from the experimenter. After a certain number of iterations--the number depends on subjects' abilities and the difficulty of the concept--both the rule and the features are identified. Subjects can then categorize correctly any stimulus and the concept is said to have been learned (see Bruner, Goodnow and Austin, 1956).

Aside from its clear subordination to the task setting, the features and rule concept representation is afflicted with other problems. As Smith and Medin (1981) and others have pointed out, the defining features assumption might be appropriate for the kind of stimulus concepts used in experiments, but it is awkward when it comes to

describing most natural object concepts. There are concepts that defy any attempt to come up with a list of defining features, such as the concept of game. Also, people seem to consider that there are instances of concepts that are more typical than others. A robin is perceived as more representative of the concept bird than a goose and a deer is a more typical instance of the concept mammal than a pig (Rips, Shoben and Smith, 1973). Clearly, the simple dichotomization into positive and negative instances implied by the features and rule model seems inadequate.

It would be inappropriate to condemn the features and rule representation strictly on the basis of its failure to explain some ambiguities related to certain types of categories. There is a growing consensus among cognitive psychologists that the formulation does not offer a satisfactory account of many categorization phenomena. Yet, it seems to remain a viable model for at least some concepts like those employed in artificial concept attainment research (e.g. all things that are green and square).

A more general role may even be possible. Smith and Medin (1981) have suggested that the memory representation of what they call the core (i.e. definition) of a concept might conform to the features and rule logic. They see the core as composed of defining features whose function is to establish clear relations with other concepts. Except for the case of artificial concepts, the features of the core would presumably be abstract. For example, the core of the house concept might be a <u>structure</u> in which <u>human beings</u> can <u>live</u> and <u>raise a family</u>. This mental definition allows a person to distinguish the

concept of a house from that of, say, a boat. However, to categorize a real world object as an real world instance of the house concept, Smith and Medin (1981) argue that the identification procedure of the concept must intervene. The features found at this level are perceptual and not necessarily defining (e.g. roof, rooms, walls, etc.).

Abstraction and Individuality

One way of dealing with the issue of typicality is to abandon the idea of concepts having features that are necessary and sufficient for determining category membership. A currently popular argument is the following. The attributes of a concept are distributed unevenly among instances and, as a result, have a probabilistic relationship with the concept. Thus the most typical instances are those that possess features that are highly probable or, equivalently, that are shared by many members of the concept. The essence of this proposal is that natural object concepts are conceived of as prototypes and deviations from prototypes (Rosch, 1977).

There appears to be some confusion surrounding the notion of a prototype. For some, it is a category member that is a particularly good illustration of the concept. For example, a robin is sometimes considered to be the prototype of the bird concept. In this sense of the term, it might be better, as Rosch (1978) suggests, to speak of degree of prototypicality instead of referring to the single prototype of a category. For others, the prototype is an abstraction that is formed through interactions with instances of the concept. For example, subjects presented with several stimulus patterns constructed by distorting prototypical forms (concepts) like faces, geometric figures or

letters, may abstract the original conceptual representations by defining the central tendency of the patterns (Franks and Bransford, 1971; Posner and Keele, 1970; Reed, 1972). A featural equivalent would consist of an abstract set of features weighted for their salience, as determined by the perceived frequency with which they are found in members of the category (Smith and Medin, 1981). It is to this latter type of summmary representations that most researchers refer to when they speak of prototypes.

The processing assumptions associated with the prototype approach depart radically from those of the features and rule model. Categorization is no longer seen as an all-or-none problem solving process, it is a matter of degree. If an object possesses a criterial number of the features contained in the prototypical representation or, in the case of quantitative components, if the distance between the object and the prototype is small enough, then it will be categorized as an instance of the concept. As Medin and Smith (1984) put it: "Categorization is thus a matter of assessing similarity rather than of applying a definition" (p. 117).

This conceptualization of the categorization process predicts that the more an object resembles the prototype, the easier its classification in the category. This is confirmed by numerous studies that have shown that speed and accuracy of categorization of new and old instances increase with the similarity to the prototype (Posner and Keele, 1970; Reed, 1972; Rosch et al., 1976). Moreover, after a delay of several days, subjects' performance in classification, as measured by reaction time and error percentage, is less subject to degradation for

prototypes than for old instances, i.e. those stimuli that were used initially by subjects to abstract the summary representation (Homa et al., 1973; Posner and Keele, 1970; Robbins et al., 1978; Strange et al., 1970).

While it may appear that the prototype perspective solves many of the problems associated with the features and rule representation, notably those identified in the typicality studies, there is yet another theoretical alternative that seems to do as well. Its fundamental proposition is that the representation of a category can be organized around one or more of its memory exemplars. That is, when thinking about a concept, a person may simply activate memory traces of specific instances that are known to be category members. For example, the house concept might correspond to one's particular experiences with known residences such as his father's or his own. The proposal makes no mention of abstractive processes like the ones characterizing both the features and rule, and the prototype category models, other than those implicit in the process of storing the instances in memory.

In fact, the absence of abstraction is one puzzling aspect of the exemplar proposal. A cognitive economy argument would rather suggest that it is more efficient to learn definitional or summary representations of concepts. However, as Brooks (1978) has pointed out, there seem to be good reasons for favoring this seemingly costly option. One is the plain observation that memory often contains a great deal of detailed information about individuals (see also Alba and Hasher, 1983). In contrast, the ontological status of prototypes is unclear, to such extent tant, at least for natural object categories, Rosch (1978) has

argued that to "speak of a prototype at all is simply a convenient grammatical fiction" (p. 40). As for rule-based representations, the incapacity to come up with clear-cut defining properties for most natural object concepts is disturbing (Medin and Smith, 1984).

Again, one notes the importance of the acquisition context in the debate. The prototype studies à la Posner and Keele (1970) always include some form of repetitive presentation of category instances to simulate and incite concept learning. Clearly, this research paradigm contrasts with the naturalistic situation where most concepts are learned through intimate and prolonged contacts with specifics. By encouraging and even forcing subjects to find commonalities between instances of the same concept, the experimental task implicitly assumes that idiosyncratic information is irrelevant to one's concept building process. Moreover it encourages a search for a rule or at least a "common denominator."

A strong point for the exemplar-based category functioning approach is that it can explain the empirical results that have been taken as evidence for the occurrence of abstractive processes. Thus the findings concerning the relationship between similarity to prototype and easiness of classification are also compatible with an exemplar-based formulation since prototypicality is directly related to possession of attributes that overlap the attributes of category members or stored exemplars (Rosch and Mervis, 1975). A more challenging problem is the observed superior performance of subjects in the classification of prototypes over that of old instances when there is a retention interval between the acquisition and the categorization phases. This has been

interpreted by many as an empirical demonstration of the use of prototypical knowledge in concept formation. But, a memory for exemplars only explanation is still workable. One simply needs to assume that the memory traces of the exemplars decay over time and that categorization is based on the best match between the presented stimulus and the exemplar memory trace. Hence, prototypical instances come to have an advantage because they remain close on average to the decaying set of memory exemplars. In contrast, single instances match only one memory trace and the match gets poorer over time. Hintzman and Ludlam (1980) have sucessfully programmed a computer-simulation model of this process.

Structural Knowledge

The interest in cognitive representation issues will certainly continue to characterize the concept formation research literature for some time. However, it seems likely that the debate will move away from its actual focus on the search for the best theory of representation of categories to a consideration of the circumstances that make specific types of representations particularly well-suited as explanatory devices. Thus one can expect to see more theoretical propositions that embrace the idea of mixed representations of concepts (Lingle, Altom and Medin, 1984; Medin and Smith, 1984; Smith and Medin, 1981). This prediction derives partly from intuitive speculations about the existence of flexible cognitive structures--somehow it makes sense to assume that concepts can develop in different and maybe complementary ways--and partly from the previously mentioned influence of the acquisition context. It must be noted again that subjects can report fairly accurately on their memory for episodic information and, at the same time, find it

meaningful to rate how well presented objects are typical of their internal conception of categories. Similarly, subjects are able to solve artificial concept learning problems and articulate features and rule solutions (see e.g. Dominowski, 1974). Overall, the accumulated empirical evidence points to the possibility of multi-level human conceptual structures; exemplars, prototypes and abstract rules (Hyman and Frost, 1975).

There are intriguing similarities between this proposal and some of the published work on the structure of human knowledge coming from other psychological domains. For instance, Abelson (1976) has suggested that people possess special kinds of cognitive structures which he calls scripts. The role of these cognitive structures is to organize the comprehension of situations by making available a number of inferences on the order and the occurrence of events (Abelson, 1981). For example, the grocery shopping script probably includes mental representations or images of sequential activities like entering the store, getting a cart, picking out items, waiting in line, paying the cashier and leaving the store (Bower, Black and Turner, 1979). Such a script permits the generation of diverse inferences that could be useful in the planning of a shopping trip; the "picking out items" vignette may remind the person to bring the grocery list or the "waiting in line" vignette may prompt an evaluation of the best times of the day to avoid a crowded store.

Most relevant to the present discussion is Abelson's (1976) suggestion that scripts exist at three processing levels; episodic, categorical and hypothetical. Episodic scripts refer to temporally

dated sequential events (e.g. last week's grocery shopping trip). Categorical scripts in contrast are generic, i.e. corresponding to prototypical event-based situations (e.g. a typical grocery shopping trip). Finally, hypothetical scripts are at the highest level of abstraction and designate feature-based computational mental operations (e.g. a cognitive rule that allows a person to evaluate grocery shopping experiences). The similarity with exemplar- , prototype- , and features and rule-based categorization processes is striking.

Script theory is often seen as a special case of a more general framework that comes under the labeling schema theory (Abelson, 1981; Alba and Hasher, 1983; Brewer and Nakamura, 1984). Scripts are also called event schemas (Fiske and Taylor, 1984; Wyer and Srull, 1980). While there are several versions of schema theory (Bartlett, 1932; Minsky, 1975; Neisser, 1976; Rumelhart, 1984; Rumelhart and Ortony, 1977), most authors seem to agree that a schema is a cognitive structure that organizes one's knowledge about a stimulus domain. Again, structural distinctions can be found in theoretical accounts of schematic notions. Thus, for Taylor and Crocker (1981) a schema "can be thought of as a pyramidal structure, hierarchically organized with more abstract or general information at the top and categories of more specific information nested within the general categories. The lowest level in the hierarchy consists of specific examples or instances . . ." (p. 92).

However, most current proponents of schema theory conceive of schemas exclusively as unconscious <u>generic</u> types of knowledge structures; schematization is, in a sense, prototypical abstraction (see Rumelhart, 1984). But as Brewer and Nakamura (1984) argue, this

theoretical position leads to difficulties when it comes to explain phenomenal experiences, i.e. concrete remembrances of images containing schema-irrelevant information. The empirical evidence reviewed by Alba and Hasher (1983) indicates that abstraction is not inevitable and that memory for details is often excellent. Their explanation is that informational units may have veridical and quite accurate corresponding traces in memory. This latter proposal is compatible with an exemplar view of schematic processing, giving some credence to Taylor and Crocker's (1981) conceptualization.

Another area where parallels with the multi-level conceptual structure can be made is that of decision making. Early attemps to capture the processing behavior of decision makers focused on mathematical models of the regression or Bayesian type (Slovic and Lichtenstein, 1971). During the last decade, thanks to the originality and ingenuity of researchers like Tversky and Kahneman (1974), this normative approach was abandoned in favor of alternative formulations more in line with what has been learned about the limited capacity of information processors. Thus it has been suggested that, because of their limited cognitive capacity, judges do not engage in extensive analytical processing of all information pertaining to the judgmental situation; rather they use cognitive heuristics that give biased but quick and, sometimes, reasonable estimates given the context.

Two heuristics of particular relevance here have been termed availability and representativeness (Tversky and Kahneman, 1974). The availability heuristic refers to the well-documented finding that people

who are asked to generate probability or frequency estimates of occurrences of certain events tend to base their judgments upon the ease with which they can retrieve specific instances from memory. For example, since deaths by accident are publicized in the newspapers, they are presumably readily available and this lead people to think that they are more frequent than deaths by stroke, which are in fact known to cause much more victims (Lichtenstein et al., 1978). The representativeness heuristic is another simplifying cognitive strategy that consists of utilizing what one knows about a population parameter or configuration to judge how well a sample event is representative of that population. For example, subjects have been shown to ignore prior probabilities of membership in a category (e.g. a profession) and base their judgment on the extent to which the sample stimulus is representative or fits their idea of the category, even though that information is undiagnostic relative to the judgment (Kahneman and Tversky, 1973). The correspondence to the exemplar and prototype category models is, again, straightforward, as noted by some authors (Glass, Holyoak and Santa, 1979; Sherman and Corty, 1984).

The above discussion has identified converging views on the nature and use of human knowledge. While specific terms and definitions do not always agree, there appears to be a rather broad base of consensus regarding the existence of cognitive structures that vary in their degree of abstractness (see the summary in Table 3-1). Of course, one could say that the convergence is illusory and that the resemblance between the proposals originating from these distinct areas of

TABLE 3-1

Converging Perspectives on Knowledge Structures

Cognitive Structure	Concept	Script	Schema	Heuristic
Major Functions	. Categorization . Conceptual combination	. Story Comprehension . Decision Making . Evaluation . Activity Planning	. Selection . Abstraction . Interpretation . Integration	. Decision Making . Estimation of Probability and Frequency
Low Abstraction Level	Exemplar	Episodic	Instance	Availability
Generic Level	Prototype	Categorical	Category	Representativeness
Abstract Level	Features and Rule	Hypothetical (Metascript)	Abstract Information	Mathematical Rule
Representative Discussions	Smith and Medin (1981)	Abelson (1981)	Alba and Hasher (1983); Taylor and Crocker (1981)	Sherman and Corty (1984); Kahneman, Slovic and Tversky (1982)

psychology merely reflects mutual influences. Yet, even if this were true, this general agreement on structural knowledge is quite remarkable.

Stage Analysis

The possibility of there being multiple concept structures at various levels of abstraction raises de novo the question as to how the categorization process unfolds. The preceding analysis of the role of the acquisition context on representation and categorization makes it very unlikely that one processing strategy can be singled out as the most probable all the time. A reasonable alternative might be to adopt the position that the nature of the categorization problem more or less dictates the type of mental activity observed during categorization. For example, the conceptual classification of highly familiar objects would seem to be an ideal set-up for exemplar-based processing. On the other hand, novel objects may induce, at some point, a more deliberative form of processing.

One potentially useful approach to the problem of mixed representations is to think of the categorization task as an evolutive operation that starts with some amount of uncertainty about the category membership of stimulus objects and, as more time is expended on the analysis, moves to a situation of increased confidence. Within this evolutive framework, the sequential use of exemplar-based and analytic processing strategies would seem to be a logical way to proceed. Matching the object with one or possibly a few memory exemplars offers a quick and simple mode of categorizing (Brooks, 1978). In those frequent situations where the object is familiar, there is even no need for

further analysis. If time permits and if the situation requires it, a more deliberative, perhaps rule-based analysis may follow.

Smith, Shoben and Rips (1974) have proposed a model of the semantic categorization task (e.g. Is a robin a bird?) that is similar to this hypothesized sequential process. Upon presentation of a test sentence of the form "An S is a P", subjects are assumed to compare the properties of the instance (S) with characteristic and defining features of the category (P) to determine holistically overall similarity. When similarity exceeds some pre-specified criterial level, say C_1, a positive response ensues. If it is less than C_0, a lower criterial level, a negative response is made. In the case where overall similarity falls between C_0 and C_1 , the model supposes a second stage of analysis where the features of the instance are compared to the defining (only) features of the category in a manner that is reminiscent of the features and rule formulation.

The Smith, Shoben and Rips (1974) model has its analogs in the memory recognition (Atkinson and Juola, 1974) and social cognition (Allen and Ebbesen, 1981) literatures, which indicates the value of postulating such sequential processes in cognitive tasks. As Srull (1984) has observed, the "fact that the same general type of model has received such strong support in three different content domains suggests that it pertains to a very central part of the information- processing system" (p. 56).

A Categorization Perspective on Evaluation

While there is an understandable interest of researchers in the processes leading to the placement of objects into cognitive categories, it is important to remember that a category assignment does not tell the whole story. Categorization involves more than mere labeling; to categorize is to simplify the external reality by molding it into existing knowledge strutures. One fundamental aspect of this process is therefore the making of inferences; to know that a stimulus object is an instance of a category leads to the inference that it has the properties associated with that category.

This latter affirmation becomes particularly interesting if affect is taken as a property of mental structures since it suggests that evaluation is an implicit result of categorization processes. This is hardly a new proposal (see e.g. the discussion of object appraisal in Smith, Bruner and White, 1956) and, furthermore, it follows syllogistically from the premises that categorization gives an object its meaning (Bruner, 1957) and that evaluation is the primary dimension of meaning (Osgood, Succi and Tannenbaum, 1957). What is new, however, is cognitive psychology's recent liberalization from the classical view of concepts (Smith and Medin, 1981) and the consequent implications for a categorization approach to evaluative judgment making.

The distinction that the concept literature draws between exemplar-based, holistic, nonanalytic versus features and rule, separable, analytic category processing extends nicely to the case of evaluation (Cohen, 1982). The nonanalytic evaluation scheme proposes that an affective reaction toward an object follows from the placing of the

object into some affect-laden mental category. The categorization itself is established on the basis of the object's overall similarity with one or a few memory exemplars, and the category's affective qualities, i.e. intensity and direction, are assumed to generalize automatically to the object. Under this scenario, the evaluative reaction occurs very early and its stability probably depends on the finality of the category judgment. The analytic version of evaluation processes follows the tradition of the algebraic model. The approach is deliberative, involving feature-based, sequential computational operations on the object (see Figure 2-1).

Analogically to the case of concept memory representation, it seems more appropriate to examine the factors that encourage the use of analytic or nonanalytic processes in evaluative judgment making than to try to single out the best theoretical explanation. As this section of the chapter will seek to demonstrate, there are good reasons to believe that both processes characterize adequately specific situations.

Knowledge Differences

A primary source of influence on one's willingness and/or capacity to engage in a given mode of evaluative processing is knowledge. Behind the analytic and nonanalytic mechanisms lay some crucial assumptions concerning memory content. Thus, if one is to apply a cognitive rule to generate an evaluative response, as the algebraic model approach posits, the rule itself must be somehow retrieved from memory in order to be executed. Cognitive rules presumably develop through past experience with objects (Wyer and Gordon, 1984); people learn about the covariation structure between their affective responses and the objects'

features. As experience accumulates, the covariation patterns may gradually be translated into rules and those become part of one's knowledge. In the same vein, exemplar-based evaluation of an object would be impracticable if the person could not find memory traces of proper instances of the object's category. The efficiency of nonanalytic evaluation is conditional on the existence of good memory exemplars.

Differences in knowledge result from differences in learning experience. A person presented with instances of a class concept on an individual basis is likely to create separate memory representations of these instances, especially if the acquisition context favors a memorization setting. In contrast, if the person is incited to concentrate on finding out the aspects of the stimuli that make them members of the category, one would expect to see the development of a classification rule at the expense of memory exemplars. Brooks (1978) has investigated the effects of such forced knowledge differences on the occurrence of analytic and nonanalytic categorization processes. In one typical experiment, subjects went through the standard hypothesis-testing concept attainment task on pictorial animal stimuli. Other subjects saw the same stimuli, but were only required to associate them with common first names. They were told the category status of the items by their name at the end of the learning period. Unknown to all subjects was a relationship between category membership and the dimensions of the varying scenic background in which the artificial animals appeared. The results of this study showed that, in the second group, subjects encoded the background information and that allowed them to classify stimuli above chance. When background was used as the categorization basis, their

classification performance on old and new stimuli was superior to that of subjects in the concept attainment group. These latter subjects, however, did significantly better on categorization based uniquely on the animals' features. According to Brooks (1978), these results demonstrate that the manner in which information is encoded impacts on memory representation which, in turn, affects the categorization process. Concept subjects were efficient in analytic processing of stimulus features but could not hope to take advantage of the background information since they had not encoded it adequately. In other words, their knowledge was principally features and rule. Memory subjects, on the other hand, learned to recognize the stimuli by their name and used the background to further increase their distinctiveness. Their knowledge was more in terms of category exemplars. According to Brooks (1978), the task performed by these latter subjects is more representative of natural concept learning situations where there are a priori multiple bases of categorization. The results suggest that, in addition to being a natural way of dealing with the stimulus environment, learning individual items along with their distinctive particularities can be very useful.

In summary, knowledge appears to be a basic variable for predicting one's evaluation strategy. The use of exemplar-based processes is contingent upon the facility with which exemplars can be located in memory. Similarly, analytic processes like those assumed by algebraic models of evaluation depend upon the ease of learning and retrievability of cognitive rules.

Context

The nonanalytic evaluation strategy is based on the assumption that one or a few exemplars are retrieved from memory to get a quick affective reaction toward new stimuli. Therefore, the availability of specific retrieval cues in the immediate internal and/or external environment may have a significant effect on the evaluative outcome. A simple example with a consumer behavior orientation will illustrate this. Assume that a consumer has developed evaluative categories for four brands and that he mentally divides them into acceptable and unacceptable. His category structure is displayed in Figure 3-1.

Before proceeding with the example, three observations on this depiction of consumer evaluative category structures must be made. First, as seen in the figure, affect is postulated to be at the level of the category. The compartmentalization on a dimension of acceptability is primarily convenient (e.g. a liking dimension with ordered categories could have been used), but it also reflects marketing researchers' belief that consumers categorize brands this way. In the marketing literature the set of familiar brands is sometimes called the "relevant set" (see e.g. Silk and Urban, 1978) and the subset of acceptable brands the "evoked set" (Howard and Sheth, 1969). In the example, brands A, B, C and D constitute the relevant set whereas brands A and B form the evoked set.

The second observation concerns the distribution of features. While acceptable and unacceptable brands would certainly have some features in common, Figure 3-1 shows none, essentially in order to simplify

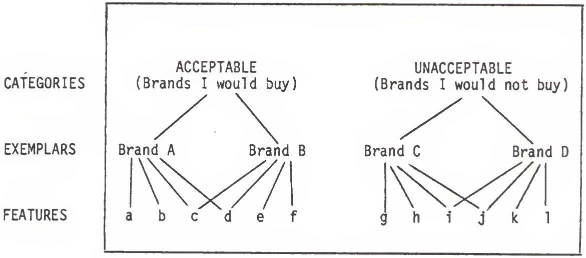

Figure 3-1. A Consumer's Hypothetical Evaluative Structure.

the presentation. The generality of the example is not affected by this voluntary omission.

The final observation has to do with some of the particularities of this type of categorization structure relative to that of common categories (e.g. furniture, birds, vegetables). While there is generally high agreement between people on the structure of common categories (e.g. a robin is definitely a bird), there may be less uniformity in the composition of consumers' evoked set (e.g. is Topol an acceptable brand of toothpaste?). Sometimes, such well-defined evaluation-based categories may not even exist in memory and, if required by the situation, may have to be constructed on the spot from whatever information can be gathered externally or internally. Some recent work in categorization research seems to be relevant here. Barsalou (1983) has argued that people often form what he calls ad hoc categories, i.e. categories whose existence is related to the attainment of various personal objectives. Some of the examples that he refers to are "ways to make friends", "things to take on a camping trip" and "places to look for antique desks." The correspondence with evoked set formation ("brands I would buy") is rather direct, as noted by some authors (Hutchinson and Alba, 1985). Barsalou's (1983) experimental results show that ad hoc categories exhibit the same typicality effects as those observed with common categories. However, in the case of ad hoc categories, the concept-to-instance memory associations are less well- established. Presumably, this is due to infrequent processing (e.g. compare vegetables and camping kit) and also, one would think, to the relative instability of instances within such categories. That is, ad hoc categories

are more context-dependent (e.g. ways to make friends in a bar versus in a classroom) and less unalterable than common categories. According to Barsalou (1983), with more processing the associations in memory are strenghtened and, eventually, the ad hoc categories come to be functionally equivalent to the common ones.

Now, in accordance with the nonanalytic scheme, evaluation results from an overall similarity matching with memory exemplars. In the example, it can be assumed that the consumer will judge a new brand acceptable or unacceptable based on its similarity with retrieved exemplars of both categories. One possibility is to think of a probability of category assignment derived from the ratio of summated family resemblance scores, i.e. number of shared features (Rosch and Mervis, 1975), between the new brand and each retrieved exemplar from the category over the summated family resemblance scores between the new brand and each retrieved exemplar from both categories. For instance, suppose that the consumer must judge the acceptability of a new brand, say N, that has features e, f, g and h. Following the family resemblance logic, if all four memory exemplars are retrieved, the probability of assignment in any of the two acceptability categories would be 0.5 since N shares no features with A and D and two features with B and C. But, suppose that with the help of some priming artifact, e.g. associative cues, only exemplars B and D are retrieved, the probabilities of assignment would then be radically different; a judgment of acceptable would be certain.

The message conveyed by this example is that nonanalytic evaluative processes are sensitive to category accessibility. By activating the memory traces of specific instances, one increases the chances that

those traces will be used during the similarity matching phase, which may result in a different outcome than if other exemplars had been rendered more accessible. The effect of priming on the ease of retrieving information from memory is well documented in the cognitive psychology (e.g. Anderson, 1980; Wickelgren, 1979) and social cognition (e.g. Srull and Wyer, 1979, 1980; Wyer and Carlston, 1979) literatures.

The priming issue has important implications for research on categorization. As mentioned earlier, the exemplar and prototype category models both provide reasonable explanations for the empirical results observed in abstraction studies. They are consequently hard to distinguish. But, the use of retrieval cues offers a partial solution. Since, in theory, increasing the accessibility of specific memory exemplars can change the judgment outcome in a predictable way (see e.g. the previous example), the mere observation of categorization results that are consistent with an exemplar-based formulation where these exemplars are assumed to be retrieved and inconsistent with a prototype model is, in and of itself, evidence for the occurrence of nonanalytic, nonprototypic process (Lingle, Altom and Medin, 1984). This is illustrated by the previous example. If the cuing of exemplars B and D results in higher proportions of classification of new brand N as acceptable, this is evidence for exemplar-based categorization. Such results would be difficult to reconcile with a prototype category model.

Stage of the Analysis

One unsatisfactory aspect of current analytic evaluative judgment making models is their restriction to component processing. As discussed in Chapter Two, the models assume sequential and discrete

processing of the dimensions or features that compose the stimuli. Their success in accounting for evaluative judgments might reside in researchers' reliance on experimental materials that constrain subjects to adopt an analytic processing style, such as verbal stimuli. Nonanalytic evaluative processing would probably be more compatible with visual stimuli.

A direct extension of the stage approach proposed earlier as a characterization of category functioning is to conceive of affect formation as proceeding also from holistic to more deliberative forms of processing. The extension goes as follows. When faced with a novel visual stimulus, one tries to place it into an existing cognitive category. As argued repeatedly, retrieving specific exemplars represents an easy and rapid way of achieving this objective. This matching process is accompanied by an affective reaction which may be somewhat vague, due to the tentative status of the category placement. Subsequent, more detailed analysis of the stimulus' particularities may be performed in order to stabilize the aroused feelings.

Lockhead (1972, 1979) has presented a general model for the perceptual processing of stimuli that is based on the same logic. The first stage of processing is holistic, that is the stimulus is perceived as one single thing (which he calls a blob) in a dimensional space. If an identification response is not accessed, the model assumes that serial processing of the stimulus constituent dimensions follows. Lockhead (1979) argues convincingly that his holistic-discriminability model can account for more experimental results than the analytic model with fewer assumptions. Ward (1983) has recently investigated this

model using a restricted classification task. Subjects were shown triads of stimuli and asked to pick the two out of three that most went together. The stimuli were lines of dots that varied according to two dimensions: length and interdot distance. The triads were constructed so that two were alike on one dimension and differed sharply on the second. The third was slightly different from one of the others on both dimensions. Ward (1983) reasoned that putting together two stimuli differing slightly on both dimensions would reflect an integral perception response while the choice of lines of dots identical on one dimension and different on the other would indicate separable processing. With these criteria, Ward (1983) showed that response time was significantly related to processing style; fast responding with holistic judgments and slow responding with dimensional judgments. These results were obtained when response time was operationalized either as an individual-difference variable (i.e. by measuring response time and reflectivity) or as a manipulated factor (i.e. by constraining responding time).

The Ward (1983) results give additional credence to the two-stage model. Together with the data of Allen and Ebbesen (1981), Atkinson and Juola (1974) and Smith, Shoben and Ribs (1974), they provide a strong empirical basis for advancing the idea of a similar sequence in evaluative judgment making.

Other Variables

Knowledge, context and stage of the analysis are the three variables that have been selected for investigation in the present study. Clearly, there are other important variables that could eventually

constitute an appropriate research focus. Some tentative ideas can be offered (see also Cohen and Basu, 1985).

Stable individual differences

As argued previously, prior knowledge of rules and exemplars would seem to have a significant impact on the individual's processing style. Other individual differences, some of which are related to knowledge, may also be relevant. For instance, there is some empirical evidence that impulsive responders are more likely to engage in holistic processing than reflective responders (see Ward, 1983). One can speculate that differences in reflectivity might also yield differences in the processes leading to evaluative judgments. Thus, reflective responders may be more inclined to adopt an analytic processing strategy to generate affective responses whereas impulsive responders would be reluctant to do so. Moreover, to the extent that reflectivity is correlated with other variables such as age, education, cognitive complexity or even personal values, one would expect these additional individual differences variables to also have an effect on the use of analytic and nonanalytic processing in evaluative judgment making.

Temporary individual differences

Temporary individual factors such as fatigue, mood or physical discomfort may prevent the person from engaging in effortful processing. In these cases, it might be easier to apply an exemplar-based evaluative processing strategy to derive the affective response.

Another potentially determinant variable is personal involvement in the evaluation task. High involvement would presumably be associated with a state of intense arousal (Cohen, 1983) and, one would think, an

increased use of more deliberative forms of information processing. Park and Young (1983), for example, have shown that, under simulated low involvement conditions, an expectancy-value model of attitude did not explain a significant amount of variance in a measure of overall evaluation. However, in the simulated high involvement condition, the model's prediction of evaluation was statistically significant. These results support the view that analytic evaluative processing might be more likely under conditions of high involvement.

Situational factors

Brooks (1978) and Cohen and Basu (1985) have suggested that the particular situation in which a categorization decision must be made may have characteristics that incite or interfere with a given processing style. For instance, under conditions of limited processing capacity caused by time pressures or distractions, the analytic strategy may be quite inefficient and the individual might rather opt for the simplicity of exemplar-based categorization. Similarly, the perceived complexity of the to-be-categorized object (e.g. number of criterical features) might dissuade the individual from engaging in rule-based processing. These propositions extend to the case of category-based evaluation in a straightforward fashion.

The above discussion on the role of situational and individual differences variables in nonanalytic evaluative judgment making has obviously been very brief. There is no doubt that these variables deserve careful examination in future research studies. Their neglect in the present research is dictated by the constraint on the number of variables to include in a single study but also, and most importantly,

by the belief that, besides being intrinsically interesting, the three identified independent variables (i.e. knowledge, context and stage of the analysis) constitute a coherent and circumscribing set of highly relevant explanatory factors.

Research Propositions

It should be mentioned that the conceptual framework developed in this chapter has some correspondence with early Lewinian notions on human behavior (see Atkinson and Birch, 1978). The well-known Lewinian equation relating behavior (B) to the interacting effects of the person (P) and the immediate psychological environment (E), i.e. $B = f(P,E)$, has its analogs in the independent variables defined in the present research. The behavior of interest (B) is evaluation and it is basically characterized as evolutive, i.e. moving from a more or less tentative position, as defined by affective generalization, to a position of greater assurance resulting from analytic execution. The personal dimension (P) is mapped into a knowledge factor that reflects idiosyncratic experience, i.e. the person's familiarity with cognitive rules that would permit a reflective judgment or the existence of memory representations of instances similar to the evaluation object. Finally, some environmental influences (E) are captured through the effects of retrieval cues that may be present at the time of the evaluative judgment. The overall conceptualization provides an integrated, interactive framework from which specific research propositions can be derived.

One fundamental proposition that has been expounded at length in this chapter is that evaluation is an evolving internal reaction that can be conceived of as a resultant of a nonanalytic-to-analytic

processing sequence. The interactive nature of the conceptual framework makes it difficult not to consider the conditionals that lie behind this theoretical statement. Thus, one would expect the sequential process to be affected by the kind of knowledge possessed by an individual. To take an extreme case, a person whose memory content would be strictly analytic, i.e. characterized by rule-based knowledge only, should be in a bad position to exhibit nonanalytic evaluative processing. He might then directly apply the rule knowledge to generate an affective response. In the very early stages of processing, this analytic judge would be uncertain as to his feelings toward the stimulus object. However, the indeterminancy would gradually disappear. At the other extreme is a person with absolutely no knowledge about rules that could be used to evaluate the object but with excellent memory for similar objects having been previously evaluated. This person would be better prepared for a rapid evaluation of the object based on overall similarity with known exemplars. But, with more time spent on evaluation, this analytically ignorant judge might come to question his initial feelings and try to adopt an analytic processing style, despite his inherent deficiency for this task. One possible consequence could then be a growing indeterminancy.

These are unlikely cases of knowledge differences. It would be hard to find such contrasting individuals in reality; knowledge of evaluation rules is clearly correlated with knowledge of evaluation categories. However, they illustrate well the impact of memory content on the ability to engage in and perform exemplar-based or analytic evaluation strategies.

The availability of contextual retrieval cues at judgment time must also be considered if predictions about affective reactions are to be made. The rationale is that the activation of particular memory exemplars with the help of associative indicants may affect the nonanalytic stage and produce early responses very different from those observed in the absence of cues or in the presence of other cues. It goes without saying that the influence of priming can only be manifested if exemplars are stored in memory. Also, by definition, the effects of associative cues on evaluation occur early in the process. However, one can speculate that their influence might extend to later processing, particularly if the person either does not possess rule-relevant knowledge required for efficient analytic deliberation or simply does not choose to engage in analytic processing.

Based on the preceding discussion, the following research propositions are therefore put forward:

P_1: In the very early stages of processing, consumers characterized by exemplar knowledge only should be in a better position to evaluate than consumers characterized by rule knowledge only.

P_2: With more processing time, consumers characterized by rule knowledge only should be in a better position to evaluate than consumers characterized by exemplar knowledge only.

P_3: In general, consumers characterized by rule knowledge only should be in a worse position to evaluate in the very early stages of processing than in the later stages of processing.

P_4: For consumers characterized by exemplar knowledge only, there should be an effect of retrieval cues both in the early and later stages of processing.

P_5: For consumers characterized by exemplar knowledge only, the effect of retrieval cues should be more important in the early stages of processing than when more time is allocated to processing.

These are the general research propositions that guide this study on evaluative judgment making. In the next chapter, the methodological procedures that have been chosen to test these various theoretical ideas are described in detail.

CHAPTER FOUR
METHOD

This chapter describes the experiment that was conducted to test the research propositions. Consistent with the theoretical framework developed in Chapter Three, the experiment sought to provide empirical evidence on the role and importance of knowledge, context and stage of the analysis in the process of making evaluative judgments. More precisely, the objectives of the experiment were to examine whether the type of evaluative processing that consumers exhibit when confronted with new products is dependent upon antecedent learning conditions, to test the effect of rendering more accessible particular subsets of memory exemplars on the evaluation of these new products, and to examine the evolution of these evaluations over two deliberation time conditions.

After having briefly discussed the rationale behind the methodological orientations given to this research, the experimental procedure is described in detail.

Experimental Rationale

The design of this study was guided by some general considerations regarding the conduct of theoretical consumer research (see Calder, Phillips and Tybout, 1981). The methodological procedures that were chosen to study the phenomenon of evaluative judgment making reflect an overriding concern about the importance of designing an experiment that leads to unambiguous conclusions as to the effects of the independent variables of interest. Therefore, internal validity

(Campbell and Stanley, 1966) and construct validity issues were given special attention and took precedence over other issues that could have jeopardized the ability to infer causal relationships among the theoretical concepts.

As an example, consider the treatment of one of the independent variables in the theoretical framework; knowledge. It was suggested earlier that the use of analytic evaluative processing necessitates that a cognitive rule be retrieved from memory. Also, nonanalytic or exemplar-based evaluation would require that exemplars be found in memory. Thus, the type of knowledge possessed by a consumer is believed to condition the ease with which analytic or nonanalytic processes are used to generate an evaluative response. One way of taking knowledge into account in the present research would be to treat it as a subject variable and try to secure an appropriate sample distribution of the characteristic. But, such a research strategy would have an adverse effect on internal validity and construct validity since subjects differing on knowledge can also differ on a number of other variables that could be responsible for any observed changes in the dependent variable. A quest for internal validity dictates that knowledge be manipulated and not simply left as an organismic variable covarying with a multitude of other subject variables.

Obviously, the decision to manipulate knowledge experimentally has had a direct impact on the structure of the experimental scenario. As explained more fully later, subjects in this experiment were asked either to learn an analytic evaluation rule or to memorize visual stimuli with well-defined affective qualities. The tasks were designed to

create maximal differentiation with respect to the type of knowledge possessed by subjects when an evaluative judgment is requested. Thus it was necessary to expose subjects repeatedly to the visual stimuli during a relatively short period of time. These experimental manipulations can be criticized for being too artificial and not representative of typical consumer learning. However, given the theoretical nature of this research study, one important goal was to get unconfounded operations of the experimental effects and this was given priority over correspondence with real-world consumer situations.

These preliminary remarks are meant to position this research as being essentially theoretical. It is an attempt at verifying the adequacy of a few theoretical propositions that have been logically deduced from previous conceptual and empirical work in areas directly or indirectly linked to research on evaluative judgment making. The resulting research design comes out of several methodological choices that were always based on the desire to devise the best possible tests of these propositions.

Procedure

Overview

For all subjects the experiment consisted of three phases. First, during the learning phase subjects were exposed to slides of ten professional-looking drawings of consumer products from a single product class. The products varied systematically over five binary attributes.

Half of the products were classified as "acceptable" and the other half as "unacceptable" according to procedures described later. In the second phase of the experiment, the classification phase,

subjects were shown ten new drawings of products from the same product class and were asked to classify them as either acceptable or unacceptable. At the end of the classification phase subjects answered various questions about the stimuli and about the task. The steps which subjects went through are presented in Figure 4-1. Subjects were run individually over a period of about three weeks in May of 1982. The experiment took place in the same room, at different times of the day, with the same experimenter. All experimental procedures are described in the following pages.

Subjects

The participants were ninety-six students in the College of Business Administration at the University of Florida, who took part in the experiment in partial fulfillment of course requirements in introductory marketing. Prior to the experiment, subjects were handed a sheet explaining the general experimental procedure, informing them of their rights and asking for their participation. All subjects signed the informed consent (Appendix A). Subjects were randomly assigned to the experimental conditions.

Stimuli

The stimuli chosen for the study were clocks. The choice was somewhat arbitrary even though there were some guiding considerations. The product had to be completely defined with only a few binary visual attributes. The limited number of attributes and their values was necessary for the experiment since some subjects had to have a good memory for the stimuli after a reasonable number of exposures. On the other hand, a product defined by too few attributes could not have been used

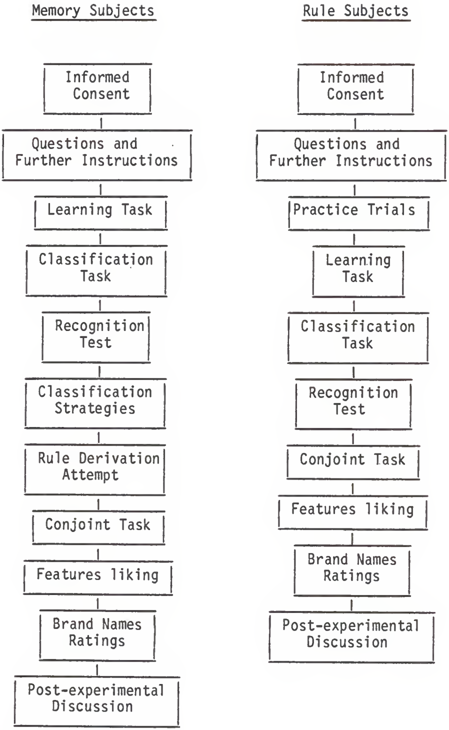

Figure 4-1. Experimental Procedures.

since other subjects had to apply a classification rule over the attribute space and their task would have therefore been too easy. A clock was defined over five binary attributes: shape, frame, minute indicators, hands and numerals (see Table 4-1). As a result, there are thirty-two possibilities. Figure 4-2 shows some examples of clocks. These are the examples that were presented to subjects prior to the learning phase.

Stimulus Arrangement

The clocks that were shown during the learning and classification phases followed a particular arrangement which was the same for all subjects. The choice of this stimulus configuration will be explained later in this chapter. The stimulus arrangement used in the study is presented in Figure 4-3. For convenience, a simple notation has been adopted. Each clock is symbolically represented by a string of five positive or negative signs, corresponding to positively or negatively evaluated features. As shown, acceptable clocks have three or more positive features (one or two negative) whereas unacceptable ones have one or two positive features (three or more negative). One can classify all clocks by applying an equal weight compensatory rule.

In order to understand the symbolic notation, consider the first clock in the learning set (i.e. clock 1). As seen, that clock is composed of five negative features. Suppose that these features are from left to right the following: outside minute indicators, stylized numerals, octagonal shape, stylized hands and thin frame. With this basic pattern, (i.e. order and feature values) the entire stimulus arrangement is specified. For example, the tenth clock would have outside

Table 4-1

Defining Attributes and their Values

Attribute	Values	
Shape	Circular	Octagonal
Frame	Thick	Thin
Minute Indicators	Inside	Outside
Hands	Stylized	Straight
Numerals	Stylized	Straight

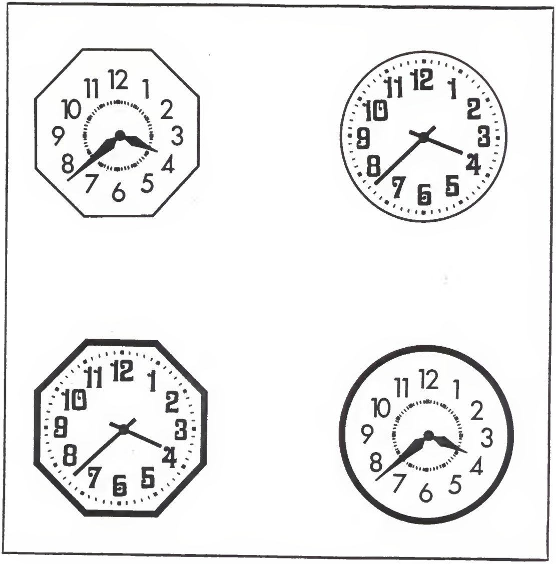

Figure 4-2. Examples of Experimental Stimuli.

Phase One Stimuli

(Learning Set)

Unacceptable	Acceptable
1. - - - - -	6. + + + + +
2. - - - - +	7. + + + - +
3. - - + - -	8. + + - + +
4. - + - + -	9. + - + - +
5. + - - - +	10. - + + + -

Phase Two Stimuli

(Classification Set)

Unacceptable	Acceptable
A. - + - - -	F. + - + + +
B. - - - + -	G. + + + + -
C. - + + - -	H. + - - + +
D. + + - - -	I. + + - + -
E. - - + - +	J. + + - - +

Figure 4-3. Stimulus Arrangement.

minute indicators, straight numerals, circular shape, straight hands and a thin frame. The other clocks would be defined in the same fashion. Note that by modifying the basic pattern, i.e. by changing the order or the values of the attributes, the whole arrangement is also modified.

Though the stimulus arrangement presented in Figure 4-3 was constant for all subjects, the specific set of clocks composing the arrangement varied across subjects. Thirty-two sets of clocks were defined by selecting as the basic pattern (i.e. clock 1) each of the thirty-two possible combinations of clock features and randomly varying their order. The result was that for all subjects the stimulus arrangement was that of Figure 4-3 while the sets of clocks were all different. The randomization scheme is explicited in more detail in the first section of Appendix B. This procedure was implemented in order to avoid that all experimental subjects' reactions be confined to one particular set of clocks. While the experimental design necessitated that the stimulus arrangement be fixed, there were no restrictions concerning which features were to be positively or negatively evaluated. In fact, a variation at this level ensured a greater generality of the observed effects.

Memory Versus Rule Manipulation

Overview

In order to vary the nature of subjects' knowledge, two tasks were employed. Subjects in the memory condition were asked to learn which clocks in the learning set were acceptable and which were not. They looked at projected slides of all ten clocks, one at a time, along

with associated brand names and the classification information given orally by the experimenter.

In the rule condition, subjects were told the classification rule, i.e. which features were positively evaluated and which were negatively evaluated, as well as the number of positive features needed to be considered acceptable. After some comprehension checks, they started to classify projected slides of the learning set clocks.

These manipulations were designed to differentiate the two groups with respect to memory for instances and rules. The memory subjects should display better memory for instances of acceptable and unacceptable clocks whereas rule subjects should have poor memory for instances but should be analytically quite efficient.

<u>Memory condition</u>

Memory subjects first read some detailed instructions on the experiment (Appendix C). These instructions emphasized the importance of being able to remember the clocks, their associated brand names and classification. Immediately after, the experimenter showed some examples of clocks (see Figure 4-2) and repeated some important points about the task: (1) to concentrate hard to remember the stimuli, (2) to look at clocks in their entirety, (3) not to try to find any classification rule, (4) that subject's own preferences had to be discarded, and (5) that associating clocks with their brand names was likely to help since brand names would serve as useful associative cues in a subsequent recognition test.

The experimenter then proceeded with the learning phase. Subjects sat in front of a large screen on which slides were automatically

projected. The clocks were presented in sequence in a pre-determined random order. The first slide announced the clock's brand name. It was followed by another slide showing the particular clock (see Figure 4-4).

During the projection of the clock slide, the experimenter either said "yes" or "no" depending upon the clock's acceptability status as defined by the stimulus arrangement. The verbal classification was consistently made two seconds after the appearance of the clock on the screen. The procedure was repeated for all ten clocks. The whole process of going through the ten clocks was done twenty times. The number of exposures to the learning set was decided on the basis of the results of a pilot study which showed that with that many clocks, subjects would need about twenty exposures in order to be able to discriminate above chance between old and new clocks.[1]

The brand names used in the experiment were those of actual manufacturers of wall clocks at the time the study was conducted. An initial list of twenty-four names was reduced to twenty by taking those that obtained highest evaluation ratings in a pilot study involving business administration students. The list of brand names is presented in Table 4-2. The assignment of brand names to clocks is discussed in the section on retrieval cues manipulation.

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1 Another way of improving subjects' memory is to reduce the number of stimuli. However, the pilot study also showed that even a small reduction in the number of clocks (e.g. eight instead of ten) was inappropriate because it greatly facilitated the construction of an ad hoc classification rule that subjects could use during the classification phase.

Slide	Exposure Duration
THE FOLLOWING CLOCK IS A (Brand name)	3 seconds
CLOCK (with verbal classification)	8 seconds

Figure 4-4. Typical Sequence of Slide Projection During the Learning Phase.

Table 4-2

Brand Names Used in the Study

1.	Bulova	11.	Sanyo
2.	Centurion	12.	Sears
3.	Elgin	13.	Seth Thomas
4.	Empire	14.	Spartus
5.	General Electric	15.	Stancraft
6.	Hamilton	16.	Sunbeam
7.	Hudson Bay	17.	Timex
8.	JC Penney	18.	Verichron
9.	K-Mart	19.	Welby
10.	New Haven	20.	Westclox

Rule condition

Rule subjects also read some detailed instructions on the experiment (Appendix D). These instructions mentioned that their task consisted in applying an equal weight compensatory rule defined by the experimenter to clocks so as to be able to classify them as acceptable or unacceptable upon projection. After they had read the instructions, the experimenter showed subjects some examples of clocks (Figure 4-2) and told them which features were to be considered as positively evaluated and which were to be considered as negatively evaluated. In order to make sure that subjects clearly understood, the experimenter asked subjects to classify the examples he had just shown using the equal weight compensatory rule (i.e. acceptable if more positive features than negative features, unacceptable otherwise).

As soon as subjects had demonstrated their understanding of the classification rule, the experimenter proceeded with the learning phase. The slide set-up was the same as in the memory condition; first slide announcing the clock's brand name followed three seconds later by the clock slide. Subjects, however, had to classify the clocks upon projection while the experimenter recorded their classification (Appendix E). The process of going through the ten clocks was done five times. A pilot study had demonstrated that this was enough to get subjects highly proficient in the utilization of the rule and that asking for more classifications only served to make the task very boring.

Short Versus Long Delay Manipulation

After the learning phase, memory and rule subjects were informed that new clocks must be classified for their acceptability. The classification task entailed two within-subjects conditions. For the short deliberation time condition the verbal instructions given by the experimenter were as follows:

> Now, in the next following minutes you will be shown five new clocks. These clocks have not been presented during the first phase of the experiment. Nevertheless, I will ask you to classify them. In the present condition you will be given an extremely short lapse of time to classify. Here is what will happen. First you will see a brand name like before. Then, for a very short exposure duration, you will see a clock. Immediately after, a blank slide will appear. I want you to tell me at this very moment "yes" or "no" depending on if you think the clock is acceptable or not. It is crucial that your reaction be quick. Tell me the first thing which comes to your mind. This blank slide will not be projected for a long time either, indicating that your response must be very quick. You will then be shown another blank slide. At this moment, I want you to tell me how confident you are in the quick classification you made. To do so you will have to give me a number from one to five using this scale (the experimenter showed the scale presented in Figure 4-5). As you see, if you are very confident you

NOT CONFIDENT						VERY
AT ALL	1	2	3	4	5	CONFIDENT

Figure 4-5. Confidence Scale.

would say "five." But if you think that you guess you would say "one." Note that you will be given more time for the confidence judgment. Note also that we will go through the five clocks without interruption. So, be prepared. Now, we will go through a couple of practice trials to give you an idea of what will happen.

Subjects were then given two practice trials to familiarize them with the procedure. The slides that were used for the practice trials were not the same type as those used during the classification phase. Thus, the first slide did not mention any of the brand names but simply said: "The following clock is a brand name." Also, the clock slide did not picture any clock but just the word CLOCK. Nonetheless, the experimenter insisted on subjects saying yes or no and giving a confidence rating as he had explained previously. The exposure durations for a typical sequence of slides are presented in Figure 4-6. The rationale for showing brand names during the classification task is presented in the next section of this chapter.

The classification task began after the two practice trials. Five clocks from the classification set were classified by subjects without interruption, in the manner described above. The slides were automatically projected on the screen while the experimenter recorded subjects' classifications and confidence ratings (Apprendix F). The choice of stimuli for classification is discussed in the section on retrieval cues manipulation.

The long deliberation time condition either preceded or followed the short deliberation time condition in a systematic way; a long-short

SLIDE	EXPOSURE DURATION	
	Short Deliberation Time	Long Deliberation Time
THE FOLLOWING CLOCK IS A (BRAND NAME)	3 seconds	3 seconds
CLOCK	1 second	3 seconds
BLANK (classification))	2 seconds	2 seconds
BLANK (confidence rating)	3 seconds	3 seconds

Figure 4-6. Typical Sequence of Slide Projection During the Classification Phase.

sequence for half of the subjects and a short-long sequence for the other half. The verbal instructions for the long deliberation time condition were similar to those given in the other condition except that subjects were told that the exposure time for the clocks would be "not too long but not too short" and that they would have a single practice trial. Some preliminary checks had shown that a single practice trial was sufficient for understanding the classification procedure in the long deliberation time condition. In the other condition, the exposure duration of the to-be-classified clocks was extremely brief (one second) and it was deemed necessary to provide two practice trials in order to prepare subjects adequately. The five remaining clocks from the classification set were classified by subjects without interruption. The procedure was identical except for the exposure duration of the stimuli (see Figure 4-6).

The purpose of the deliberation time manipulation was to show that in the early stages of evaluation (classification) memory subjects would have an advantage over rule subjects. This is because they were supposed to know more about individual instances and that a classification based on the overall similarity between the new stimuli and the stored exemplars was likely to be more efficient than a guessing strategy. With a very brief exposure time (one second in the experiment), rule subjects were expected to have great difficulty in classifying the stimuli. However, due to the sequentiality of the classification rule, this depended on the number of positive and negative features a given clock had. As a pilot test confirmed, a very acceptable (unacceptable) clock, i.e. having four positive (negative) features, was easier to

classify than a just acceptable (unacceptable) one, i.e. with three positive (negative) features, when the classification rule was known.

Retrieval Cues Manipulation

The stimulus arrangement presented in Figure 4-3 was not chosen haphazardly. As mentioned previously, in order to minimize the number of exposures to the learning set while at the same time making the discovery of an ad hoc rule difficult, there had to be about ten clocks; five in each category of acceptability. There was, however, a more important consideration in the design of the stimulus arrangement; that of showing that classification could be based on the similarity matching of the to-be-classified stimuli with some specific instances in memory.

Consider for example stimulus E in Figure 4-3. This clock has more common features with the mode-based prototype of the category "unacceptable" than with that of the category "acceptable." Assuming that memory subjects use a classification strategy of comparison with both prototypes (e.g. see Reed, 1972), then E would probably be more often classified as unacceptable. However, E also shares more common features with unacceptable instances of the learning set, so that a categorization model positing that the comparison is made with all memory instances would lead to the same results. Any attempt to distinguish between these alternatives with the present methodology, i.e. by looking at the proportions of correct classifications, is bound to fail partly because of the necessity to rely on some abstract mathematical formulation to generate predicted classifications. Perhaps, some reaction time measurements could be of some help (see e.g. Hyman and Frost, 1975), but it is doubtful since even then these competing models would

still be highly correlated. Therefore, it was believed that a better research goal was to demonstrate that some exemplar-based similarity process could occur. Along this line of reasoning, the experimental "priming" of selected subsets of category exemplars appeared to be an interesting strategy to pursue since it would render these exemplars more accessible in memory, which would then allow the verification of their use by subjects for classification.

Consider again stimulus E and assume that exemplars 4 and 9 are made more accessible in memory. If subjects base their classification on the similarity with these exemplars, then a judgment of acceptable would be more likely since E is much more similar to 9 (an acceptable instance) than it is to 4 (an unacceptable instance). This is of course contrary to the predictions of a prototype categorization model and to those of an exemplar model where E is compared with all members of both categories. Thus, if subjects make more acceptable category judgments of E when exemplars 4 and 9 are cued, this can be taken as evidence that an exemplar-based categorization process has occurred. Note that the argument also holds for stimulus J with exemplars 5 and 10, except for the switching of acceptable to unacceptable. This prediction of classification reversal when specific retrieval cues are present provides the rationale for inferring the use of exemplar-based category processing by subjects in this experiment.

The retrieval cues manipulation consisted in associating the classification stimuli E and J with the same brand names as the learning stimuli 4 and 9, and 5 and 10 respectively. The brand names of all other stimuli, either from the learning set or from the classification

set, were different. As a concrete illustration, consider Figure 4-7. It shows a typical learning set associative structure (corresponding in fact to stimuli presented to one memory subject in the experiment). In this example, the positive features were defined as thin frame, stylized hands, octagonal shape, straight numerals, and inside minute indicators in that order (see the Centurion clock). Figure 4-7 also presents the priming stimuli, i.e. the E (JC Penney) and J (Empire) clocks. The other classification set stimuli (i.e. A, B, C, D, F, G, H, and I) are not shown. In order to facilitate the transition from the notational system used in Figure 4-3 and this concrete illustration, Figure 4-8 shows the correspondence between the brand names used in this example and the strings of positive and negative features used to define the stimulus arrangement. The columns have also been labeled according to which specific feature each represents. Note that clocks 4 and 9 (5 and 10) from the learning set and the to-be-classified clock E (J) share the same brand name.

Now, consider the to-be-classified JC Penney clock. Overall, the clock appears more similar to the unacceptable set. In fact, by definition (see Figure 4-8), it has more unacceptable features (three out of five). Therefore, one would expect that a classification into the category unacceptable to be more likely for this clock. However, if the comparison is made with the two clocks sharing the same brand name, it becomes obvious that a classification of acceptable is highly probable, since the clock has more features in common with the acceptable JC Penney clock (four out of five) than with the other (one out of five). The same reasoning applies to the Empire clock, except that the

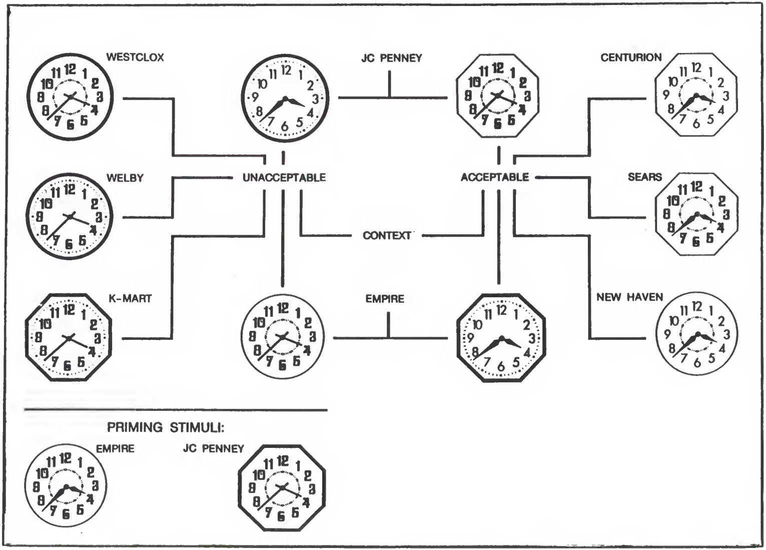

Figure 4-7. A Typical Associative Structure.

Unacceptable							Acceptable						
	Clock					Brand Name		Clock					Brand Name
1.	-	-	-	-	-	Welby	6.	+	+	+	+	+	Centurion
2.	-	-	-	-	+	Westclox	7.	+	+	+	-	+	Sears
3.	-	-	+	-	-	K-Mart	8.	+	+	-	+	+	New Haven
4.	-	+	-	+	-	JC Penney	9.	+	-	+	-	+	JC Penney
5.	+	-	-	-	+	Empire	10.	-	+	+	+	-	Empire
E.	-	-	+	-	+	JC Penney	J.	+	+	-	-	+	Empire

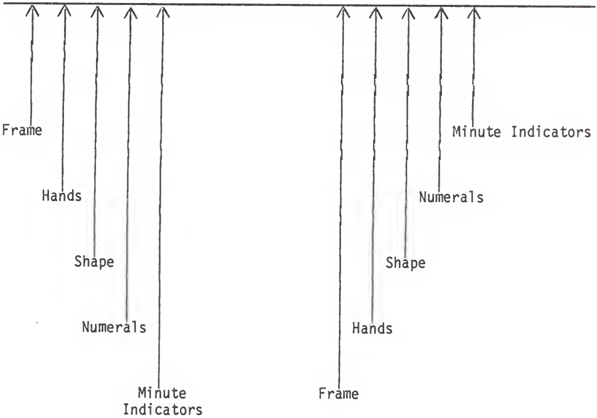

Figure 4-8. Correspondence Between the Notational System and the Concrete Illustration.

classification reversal would go in that case from acceptable to unacceptable. So, it can be seen that the stimulus arrangement is organized such that the priming stimuli are more similar to specific exemplars of the incorrect category. The priming procedure works through the use of common brand names. By presenting these brand names prior to the classification of the stimuli (see Figure 4-6), it was hoped that the corresponding exemplars would be activated and would serve as a comparison basis for classification. The expected result is, for both the E and J stimuli, a classification reversal.

One important characteristic of the priming procedure concerns the fact that the brand name associated with the priming stimuli was shared by two clocks in the learning set; one from each acceptability category. An alternative way of proceeding would have been to have the priming brand name shared by only one clock from the incorrect category. However, by doing so and in the event that a classification reversal would occur, one could not distinguish between an exemplar category processing explanation and one assuming that a category-brand name matching heuristic was used. That is, subjects could adopt the rule consisting in classifying the clock on the basis of its brand name only. Recalling that one brand name was associated with a particular category, subjects would simply classify the clock as a member of that category. While the use of two common brand names could not prevent subjects from using a category-brand name matching rule, at least it did not bias the categorization results in a direction consistent with the theoretical predictions.

Given the stimulus arrangement defined in this study (see Figure 4-3), there are two strategies that can be implemented to verify the effectiveness of the retrieval cues manipulation in inducing exemplar-based processing. A within-subjects strategy would consist in comparing the proportions of incorrect classification of the priming stimuli E and J with those of other (non priming) classification set stimuli that have the same a priori probability of being incorrectly classified. There are four such stimuli in the classification set: the unacceptable C and D, and the acceptable H and I. It can be seen that C and D have three negatively evaluated features, the same number as the E stimulus. Similarly, H and I have three of their features that are positively evaluated, just like the J stimulus. A between-subjects strategy would consist in comparing the misclassification proportions of the E and J stimuli in two groups: one where the retrieval cues (i.e. common brand names) are provided and one where they are not. This latter group would serve as a control. Both strategies are used in this study.

Additional remarks

Before discussing the control conditions of the experiment, a few remarks are in order.

Defining feature rule. Suppose subjects in the experiment use a defining feature rule to generate their classification of the experimental stimuli. Given the nature of the stimuli used in this study, it may be the case that some features are more salient than others (e.g. thickness of the frame) and that subjects induce from the learning phase a defining feature rule (e.g. all thick clocks are unacceptable) which is not totally accurate but which gives a satisfactory categorization

hit ratio. Assuming this is the case, the question of interest is whether the stimulus arrangement (Figure 4-3) is such that this can affect the experimental results in a manner consistent with the theoretical predictions related to the retrieval cues manipulation. This question is addressed in detail in Appendix B where it is shown that there is no apparent bias of the stimulus arrangement toward the confirmation of these predictions.

Brand names assignment. In general, the assignment of brand names to all stimuli was done as follows.[1] First, two brand names were randomly selected from the list of twenty brand names (Table 4-2) and associated with stimuli E, J, 4 and 9, 5 and 10. Then, all other stimuli were attributed a different brand name randomly selected from the list of eighteen remaining names. This procedure was repeated for the thirty-two sets of clocks. To illustrate, refer again to Figure 4-7. In this example, JC Penney and Empire would have been selected randomly from the list of brand names and assigned to the retrieval cues manipulation clocks. Then, all other clocks would have gotten a different brand name randomly selected from the eighteen remaining brand names of the list.

Assignment of stimuli to delay conditions. During the classification phase, for both deliberation time conditions the priming stimuli (E and J) were always the third in the sequence of five to be classified. For half of the subjects, the exposure time was short for clock

1 The assignment procedure was different for the control conditions (see the next section).

E, longer for J. For the other half, it was the reverse. The other classification stimuli were assigned to the short and long deliberation time conditions on the basis of a latin square arrangement with the constraint that there were to be as many acceptable as unacceptable clocks in a given deliberation time condition (see Figure 4-9). The purpose of the latin square arrangement was to spread equally the exposures to each classification stimulus in the between-subjects and within-subjects experimental conditions. The actual structure itself was not used in the statistical analysis of the data.

There were thirty-two subjects in each of the learning conditions. Each memory subject was paired with a rule subject with regard to the stimuli (clocks and associated brand names) that were used in the learning and classification phases as well as the order in which these were presented.

Control Conditions

Two control conditions were defined. In the first (equiprobability control), the retrieval cues manipulation was modified such that the two retrieved memory exemplars would have an equal number of features (arbitrarily fixed at four) in common with the to-be-classified priming stimuli. Thus the brand name of stimulus E was the same as that of stimuli 3 and 9. That of stimulus J was the same as that of stimuli 5 and 8. Again, to provide a concrete illustration, one can imagine in the associative structure presented in Figure 4-7 that the to-be-classified JC Penney clock is compared with the K-Mart and the acceptable JC Penney clocks, and that the to-be-classified Empire clock is compared with the New Haven and the unacceptable Empire clocks.

Subject Number	Short	Long	Short	Long
1 and 17	A,B,F,G	C,D,H,I	E	J
2 and 18	B,F,G,C	D,H,I,A	J	E
3 and 19	F,G,C,D	H,I,A,B	E	J
4 and 20	G,C,D,H	I,A,B,F	J	E
5 and 21	C,D,H,I	A,B,F,G	E	J
6 and 22	D,H,I,A	B,F,G,C	J	E
7 and 23	H,I,A,B	F,G,C,D	E	J
8 and 24	I,A,B,F	G,C,D,H	J	E
9 and 25	A,B,F,G	C,D,H,I	J	E
10 and 26	B,F,G,C	D,H,I,A	E	J
11 and 27	F,G,C,D	H,I,A,B	J	E
12 and 28	G,C,D,H	I,A,B,F	E	J
13 and 29	C,D,H,I	A,B,F,G	J	E
14 and 30	D,H,I,A	B,F,G,C	E	J
15 and 31	H,I,A,B	F,G,C,D	J	E
16 and 32	I,A,B,F	G,C,D,H	E	J

Figure 4-9. Latin Square Arrangement for the Classification Stimuli.

Note however that in the experiment, the to-be-classified and comparison stimuli shared the same brand name. Assuming that the retrieval cues manipulation is successful, the expectation is that the classification decisions of subjects in that control condition should be about equally divided between the two acceptability categories, a result that would also be expected if no retrieval cues are provided. This was the situation in the other control condition (no cues control) where there were no cues, i.e. no common brand names between any of the twenty learning and classification sets stimuli. The number of subjects in each of the two control conditions was sixteen and both were crossed with the learning (i.e. memory versus rule) conditions.

Concluding Remarks on the Experimental Design

As mentioned earlier, the experiment was designed to permit within-subjects and between-subjects comparisons to test the effectiveness of the retrieval cues in inducing exemplar-based processing. The within-subjects structure of the design allows for the comparison of subjects' classification performance for non-priming (i.e. C, D, H, and I) and priming (i.e. E and J) stimuli. That structure is illustrated in Figure 4-10. The between-subjects structure of the design allows for the comparison of experimental (priming) and control subjects in classification performance. That structure is shown in Figure 4-11. These two design structures correspond to the two types of statistical analysis performed on the data and presented in the next chapter.

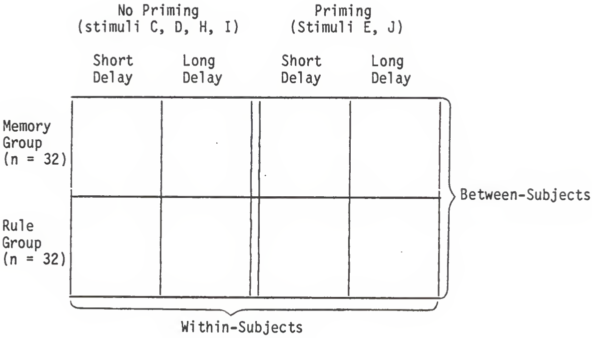

Figure 4-10. Experimental Design Structure for Within-Subjects Comparisons.

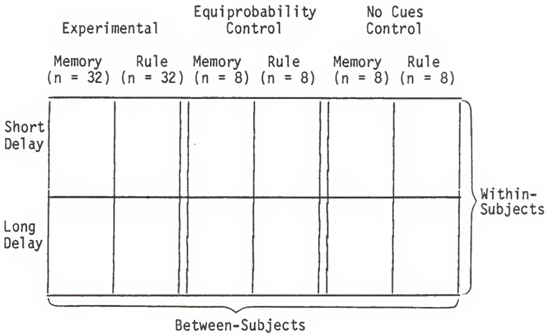

Figure 4-11. Experimental Design Structure for Between-Subjects Comparisons.

Recognition Test

Following the classification phase, all subjects were tested for memory. They had to recognize which clocks and associated brand names were presented during the learning phase. For this, they were handed twenty small-size reproduced clocks (about two by two inches) of which ten pictured clocks of the learning set and ten were new. The new clocks did not correspond to any of the classification set stimuli (see Figure 4-12). All clocks were presented in a random order.

The brand names that were used during the learning phase were listed on a sheet that was made available. Subjects' task was to pick out the ten old clocks, classify them for acceptability, assign the brand names correctly, and give a confidence rating for each brand name-clock pair. Two specially prepared sheets on which the small clocks could be placed and moved at ease were provided to help them with this task (Appendix G).

Classification Strategies

After they were finished with the recognition test, memory (experimental and control) subjects were asked to specify what strategy (ies) they thought they had used during the classification phase (Appendix H). In order to avoid that they be too nebulous about the subject a multiple choice set-up was employed. Four options were available, corresponding to prototype-based, analytical, exemplar-based and brand name association strategies (see Figure 4-13). Subjects could check more than one option if they thought one was not sufficient to describe what happened. They did this in the perspective of the short and long deliberation time conditions.

- - - + +	- + - + +
- - + + -	+ - + + -
+ - + - -	- + + - +
- + - - +	+ + + - -
+ - - + -	- - + + +

Figure 4-12. New Clocks in the Recognition Test.

Options	Corresponding Strategy
. I just looked at the clock overall and tried to match it with my idea of an acceptable or an unacceptable clock.	. Prototype-based
. I looked at each clock's characteristics in detail and tried to see if it seemed to possess what I think are characteristics of an acceptable or an unacceptable clock.	. Analytical
. Some of these new clocks looked very similar to clocks that were shown previously, so I made my judgment based on this similarity, that is I recalled the classification of some similar clock(s) I had seen and classified the new clock accordingly.	. Exemplar-based
. Sometimes during the classification task I would see a brand name that had been presented before and this would help me recall the clock(s) that was (were) associated with this brand name and consequently help me classify the new clock.	. Brand Name Association

Figure 4-13. Strategies for Classification.

Rule Derivation Attempt

Following the classification strategy task, memory subjects were asked to guess what were the positive and negative features of the clocks and to rate how confident they were overall in their estimate of the category prototypes (Appendix I).

Other Tasks

All subjects completed the study by giving evaluation ratings of the stimuli. A one-half fractional factorial replication was constructed from the set of thirty-two possible clocks and used in a conjoint task. Subjects evaluated the sixteen randomly presented clocks on six scales (Figure 4-14). They also rated the features that were used to compose the clocks on the same scales (Apprendix J). Finally, they evaluated all brand names on a very poor buy-very good buy nine-point scale (Appendix K).

Although these evaluation data were collected as part of this research study, they served no specific purpose with regard to testing the basic research propositions. They were collected mainly to constitute a data set upon which further exploratory analyses could be performed. Accordingly, no reference is made to these data in the next chapter.

Postexperimental Discussion

Before leaving the experimental room, the experimenter answered any questions subjects could have concerning the study. Subjects were also asked to describe their reactions toward the various tasks they had to perform. None of the subjects could guess the true objectives of the study.

Ugly	1	2	3	4	5	6	7	8	9	Beautiful
Plain	1	2	3	4	5	6	7	8	9	Fancy
Ordinary	1	2	3	4	5	6	7	8	9	Unusual
Pleasing	1	2	3	4	5	6	7	8	9	Displeasing
Stylish	1	2	3	4	5	6	7	8	8	Unstylish
I dislike it very much	1	2	3	4	5	6	7	8	8	I like it very much

Figure 4-14. Rating Scales for Experimental Stimuli.

CHAPTER FIVE
RESULTS

This chapter presents the statistical analyses conducted on the experimental data. The first section is concerned with some basic verifications about the experimental manipulations. This involves making sure that the learning differentiation of subjects was effective and also that the elements that have the potential to produce a priming effect were in place. The plausibility of the research propositions is then examined.

Manipulation Checks

This section addresses the issue of effectiveness of the manipulations. Two aspects are of primary interest. The first has to do with the differentiation of memory and rule subjects in terms of memory content. The second concerns the verification that the necessary conditions for the retrieval cues manipulation to affect subjects' categorization processes are present.

Memory for Stimuli

As stated previously, the purpose of the memory versus rule manipulation was to create important differences in subjects' memory structure. One such difference is that memory subjects should have a much better remembrance of the learning stimuli than rule subjects. This is because memory subjects were specifically told to concentrate on remembering the stimuli, their category status and their associated brand names, whereas rule subjects were asked to classify the clocks that were presented. In addition, subjects in the memory group went

through twenty exposures to the learning set, i.e. four times as many exposures as for rule subjects. The recognition test (Appendix G) data can be analysed to verify if indeed the expected memory differences are observed.

Definition of the memory indices

Since the recognition test gives data on subjects' memory performance for clocks and brand names as well as confidence ratings, various memory indices can be considered. The interest is limited here to four such indices. Their operationalization, interpretation and range of values are summarized in Table 5-1.

Two indices are restricted to memory for clocks; one incorporates confidence judgments (INDEX2) while the other does not (INDEX1). The two other indices are intended to assess the correctness of subjects' brand names assignations as well. Again, one incorporates confidence judgments (INDEX4) while the other does not (INDEX3). The information on memory recognition of both the stimuli and the associated brand names is of importance because the success of the retrieval cues manipulation depends among other things on the existence of such memory links.

Results

Table 5-2 displays the cell means of the four memory indices. As it can be seen, memory subjects' mean indices are consistently higher than rule subjects' and this result holds for experimental and control groups. A series of analyses of variance confirms that there is a significant main effect of the learning factor for all indices (see

Table 5-1

Memory Indices

Operationalization[a]	Interpretation	Minimum-Maximum Value
$INDEX1 = \sum_{i=1}^{10} INCLU_i$	Number of clocks correctly recognized.	0 - +10
$INDEX2 = \sum_{i=1}^{10} INCLU_i' * CONF_i$	Summated memory rating score: high confidence recognition error to high confidence correct.	-50 - +50
$INDEX3 = \sum_{i=1}^{10} INCLU_i * CBN_i$	Number of clocks with proper brand name correctly recognized.	0 - +10
$INDEX4 = \sum_{i=1}^{10} (INCLU_i * CBN_i)' * CONF_i$	Summated memory rating score: high confidence clock and/or brand name recognition error to high confidence clock and brand name correct.	-50 - +50

a The summation is done over the ten clocks appearing on the test. $INCLU_i = 1$ if i^{th} clock is included in the learning set, $= 0$ otherwise; $CBN_i = 1$ if i^{th} brand name is correct for the i^{th} clock, $= 0$ otherwise; $INCLU_i' = 1$ if i^{th} clock is included in the learning set, $= -1$ otherwise; $(INCLU_i * CBN_i)' = 1$, if $(INCLU_i * CBN_i) = 1$, $= -1$ otherwise; $CONF_i$ is a confidence index ranging from one to five (see Figure 4-5).

Table 5-2

Cell Means (and Sample Sizes) of the Memory Indices

Learning Groups		Experimental Groups: Experimental	Equiprobability Control	No cues Control
Memory	INDEX1	6.9375 (32)	7.0000 (8)	7.2500 (8)
	INDEX2	17.5484 (31)	15.1250 (8)	25.8571 (7)
	INDEX3	4.3750 (32)	5.0000 (8)	5.5000 (8)
	INDEX4	2.6452 (31)	2.3750 (8)	15.5714 (7)
Rule	INDEX1	5.5000 (32)	5.5000 (8)	6.2500 (8)
	INDEX2	3.3448 (29)	2.7500 (8)	8.6250 (8)
	INDEX3	1.0000 (31)	0.8750 (8)	1.7500 (8)
	INDEX4	-16.8621 (29)	-14.2500 (8)	-12.8750 (8)

Table 5-3). No other effects reached the .05 level of significance.[1] These results are conclusive with respect to the success of the learning manipulation. Moreover, the difference in memory performance is fairly impressive given that rule subjects completed the test with an advantage over memory subjects; since they knew the rule, they could correctly classify all stimuli.[2]

Priming Potency

The recognition test data can also reveal if the potential for a retrieval cues (priming) manipulation to succeed is present. If the assumption that these data reflect subjects' memory structure during the classification phase is tenable, then it is possible to verify that the retrieval of specific memory exemplars for classification purposes would in fact lead to a higher probability of misclassification of stimuli E and J, the priming stimuli, as the theoretical rationale suggests.

Consider for example Figure 5-1 where the recognition test data of one experimental memory subject is reported. For the sake of continuity with previous discussions, the same notational system is used to represent the stimuli. Furthermore, the test data are those of the memory subject whose learning set associative structure was discussed in the Method Chapter (see Figures 4-7 and 4-8). However, while Figures 4-7 and 4-8 report learning set stimuli as presented, Figure 5-1 reports learning set stimuli (in symbolic form) as recognized by the subject.

1 Because the factorial design is not orthogonal (unequal n's), Appelbaum and Cramer's (1974) general linear model approach was applied in the computation of the different sums of squares.

2 Indeed the number of correct classifications in the test is significantly higher for rule subjects than for memory subjects ($p = .0036$).

Table 5-3

Analysis of Variance Results on Memory Indices

Factors	Degrees of Freedom	INDEX1		INDEX2		INDEX3		INDEX4	
		F[a] Statistic	P[b] Value	F Statistic	P Value	F Statistic	P Value	F Statistic	P Value
Experimental Groups (A)	2	0.84	0.4343	2.65	0.0762	1.12	0.3313	1.37	0.2583
Learning (B)	1	20.71	0.0001	38.62	0.0001	59.71	0.0001	32.31	0.0001
A x B	2	0.15	0.8575	0.19	0.8279	0.19	0.8269	0.52	0.5956

a All tests of hypotheses use the within-groups mean square as the denominator in the F ratio.

b All tests are two tailed.

	Unacceptable							Acceptable					
	Clock					Brand Name		Clock					Brand Name
1.	-	+	-	+	+	Welby	6.	-	+	+	+	-	Centurion
2.	-	-	-	-	-	Westclox	7.	-	-	+	+	-	Sears
3.	+	-	+	-	+	K-Mart	8.	+	+	-	+	+	New Haven
4.	-	+	-	+	-	JC Penney	9.	-	+	+	-	+	JC Penney
5.	+	-	-	-	+	Empire	10.	+	-	+	+	-	Empire
E.	-	-	+	-	+	JC Penney	J.	+	+	-	-	+	Empire
	Estimated Prototype							Estimated Prototype					
	+	-	-	-	-			-	+	+	+	+	

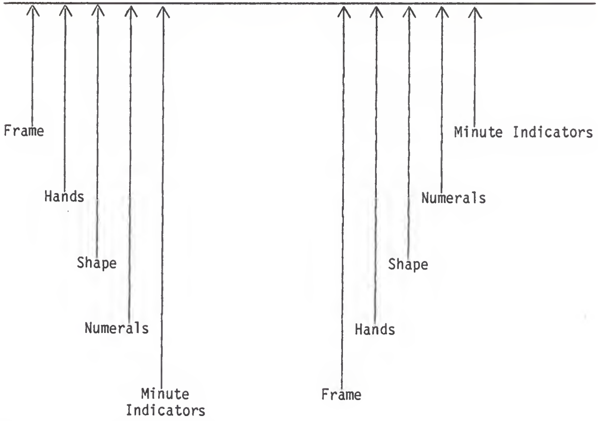

Figure 5-1. Recognition Test Data, Prototypes and Classification Stimuli of one Experimental Memory Subject.

Note that this subject's memory for the learning set is not totally accurate (compare Figures 4-8 and 5-1). In certain cases, recognition memory is perfect (e.g. the unacceptable JC Penney and Empire clocks); in other cases it is not (e.g. the Welby and Sears clocks).

Figure 5-1 also reports some other relevant data: the estimated prototypes of both categories and the two classification stimuli of interest (E and J). It is important to know that the prototypes reported in Figure 5-1 are not the "true" prototypes, that is those which serve as basis for defining the featural structure of the stimulus arrangement. They correspond to this subject's estimate of what the positive and negative features were. As recalled, these data were collected during the rule derivation attempt stage (Appendix I and Figure 4-1). As Figure 5-1 shows, this subject correctly identified four of the five featural values composing the "true" prototypes.

Now, consider the expected probability of correctly classifying the priming stimuli assuming the test data reflect that subject's associative memory structure during the classification stage. That probability depends on the type of categorization processes characterizing the subject at classification time. Three possible categorization strategies can be proposed. The first assumes that the individual judges a clock's acceptability on the basis of its similarity with all exemplars of both categories. The second assumes that the individual retrieves only the primed exemplars to make his judgment. The third assumes a comparison with abstracted prototypes of both categories. These will be referred to as complete memory scanning (SCA), priming (PRI) and prototype (PRO) categorization strategies respectively.

Using the same rationale as in Chapter Three (see p. 78), one can think of a probability of categorization obtained from the ratio of summated family resemblance scores, i.e. number of shared features between the to-be-classified clock and each retrieved exemplar or prototype from the category over the summated family resemblance scores between the to-be-classified clock and each retrieved exemplar or prototype from both categories. The precise mathematical formulation is the following:

$$p(x) = \frac{\sum_{i \varepsilon c} f_{x_i}}{\sum_{i \varepsilon c} f_{x_i} + \sum_{j \varepsilon I} f_{x_j}} \tag{5-1}$$

where p(x) is the expected probability of correctly classifying clock x (E or J), f_{x_i} is the number of common features between x and exemplar i, and c and I are the subsets of retrieved exemplars from the correct and incorrect categories respectively. Under the assumption of complete memory scanning, c and I are the sets of clocks that subjects report on the test. Under the assumption of a priming model, c and I are the primed stimuli, as identified by their common brand name with x. As for the prototype model, c and I are the abstracted summary representations estimated by the rule derivation attempt data.

The computations of the probabilities can be illustrated with the example of Figure 5-1. Consider for instance the expected probability of correctly classifying the E clock under the assumption of complete memory scanning. The sum of common features between E and the unacceptable stimuli is thirteen (two with the Welby clock, three with the Westclox, etc.). As for the acceptable clocks it is twelve. The

resulting probability is therefore equal to 13/(13 + 12), i.e. 0.52. Now, assuming a priming model, only the JC Penney clocks would presumably be retrieved. Since E shares one feature with the unacceptable JC Penney clock and four with the other, the probability is therefore equal to 1/(1 + 4), i.e. 0.20. Finally, it is easy to verify that if only the prototypes are retrieved, the probability becomes 0.40.

Application of equation (5-1) thus leads to the following probabilities:

Model	p(E)	p(J)
Complete Scanning (SCA)	0.5200	0.3900
Prototype (PRO)	0.4000	0.4000
Priming (PRI)	0.2000	0.2000

As expected, for this subject the probability of correct classification of both the E and J clocks is smaller if the judgment is based on the retrieval of primed stimuli. This is because the subject belongs to the experimental group and his associative memory structure, as reconstituted from the recognition test data, correctly reflects the stimulus learning set. In other words, this subject's memory structure seems to have the potency for a retrieval cues (priming) manipulation to succeed since, assuming the recognition test data provide a good approximation of his associative structure at classification time, a categorization model based on the retrieval of primed exemplars leads to lower probabilities of correct classification (i.e. more chances of classification reversal). Note however that the probabilities are obtained via a mathematical model that is not intended to be a formal representation

of the categorization process. They are meant to be rough estimates of relative classification performance if the processes modeled by equation (5-1) are taking place.

The recognition data were used to reconstitute experimental and equiprobability control memory subjects' associative memory structure. The analysis was restricted to these groups since they correspond to the only conditions where a manipulation check on priming is relevant. Recall that common brand names between classification and learning stimuli appeared only in the stimulus arrangements of experimental and equiprobability control subjects. As in the example discussed above, expected probabilities of correct classification of the priming stimuli under three processing models were computed. The results for all memory subjects in the relevant conditions appear in Table 5-4. In the experimental condition, the mean probabilities of correct classification for stimuli E and J are smaller for the priming model and paired t-tests (Table 5-5) confirm that these differences are reliable. In the equiprobability control condition, the differences are not significant (Table 5-6). This also confirms the expectations since, as explained in the Method Chapter, although the participants assigned to this memory control condition were subjected to a retrieval cues manipulation, contrary to subjects in the experimental group, their stimulus learning set was organized so as to nullify the effect on classification. That is, their priming stimuli (E and J) were associated through common brand names with exemplars of both acceptability categories having comparable similarity status, as objectively measured by the number of shared

Table 5-4

Mean Probabilities of Correct Classification (and Sample Sizes) Under Three Processing Models

	Memory Condition			
	Experimental		Equiprobability Control	
Model	p(E)	p(J)	p(E)	p(J)
Complete Scanning (SCA)	0.4616 (32)	0.5306 (32)	0.4700 (8)	0.5263 (8)
Prototype (PRO)	0.5143 (21)	0.5333 (21)	0.5200 (5)	0.5600 (5)
Priming (PRI)	0.3366 (32)	0.3631 (32)	0.4463 (8)	0.5338 (8)

Table 5-5

Analytical Comparisons for Priming Potency: Experimental Memory Subjects

Comparison[a]	Degrees of Freedom	p(E)		p(J)	
		t-Statistic	P-Value[b]	t-Statistic	P-Value[b]
SCA versus PRI	31	3.51	0.0014	4.10	0.0003
PRO versus PRI	20	2.82	0.0106	2.14	0.0450

a SCA = complete memory scanning model; PRI = priming model; PRO = prototype model.

b Two-tailed tests.

Table 5-6

Analytical Comparisons for Priming Potency: Equiprobability Control Memory Subjects

Comparison[a]	Degrees of Freedom	p(E)		p(J)	
		t-Statistic	P-Value[b]	t-Statistic	P-Value[b]
SCA versus PRI	7	0.28	0.7876	-0.48	0.6444
PRO versus PRI	4	1.45	0.2218	0.41	0.7040

a SCA = complete memory scanning model; PRI = priming model; PRO = prototype model.

b Two-tailed tests.

features. Consequently, their classification responses to priming stimuli were expected to be category equiprobable.

One final prediction that follows from the above discussion is that the mean expected probabilities of correct classification assuming a priming model should be lower for experimental than for equiprobability control memory subjects. As Table 5-7 reveals, this is true for acceptable stimuli (J). The difference in mean probabilities however only approaches statistical significance in the case of unacceptable stimuli (E). These results are particularly consequential for the meaningfulness of eventual between-subjects comparisons on classification performance involving subjects in the experimental and equiprobability control conditions, since these latter subjects' assumed probability of misclassifying unacceptable clocks, under the assumption that the priming manipulation is successful, seems to be as high as that of experimental memory subjects. This problem is addressed in more detail later when such between-subjects comparisons are considered.

Summary

The results presented in this section show that the learning manipulation succeeded in giving memory subjects a better remembrance of the clocks and their associated brand names than rule subjects. Also, the priming potency results suggest that in general subjects' memory structures were organized so as to allow the retrieval cues manipulation to work.

Within-Subjects Analyses

In this section the focus is on the examination of subjects' performance in classification across the different experimental

Table 5-7

Comparisons Between Mean Probabilities of Correct Classifications of Experimental and Equiprobability Control Memory Conditions

	Group			
Probability	Experimental	Equiprobability Control	t-Statistic[a]	P-Value[b]
p(E)	0.3366	0.4463	1.54	0.0657
p(J)	0.3631	0.5338	2.01	0.0256

a With 38 degrees of freedom.

b One-tailed tests.

conditions and within the stimulus set. After having defined the dependent variables and framed the research propositions in a series of analytical comparisons, it will be shown that the priming stimuli can be compared to other classification set stimuli. These latter will serve as controls for establishing the influence of priming upon subjects' categorization processes. Refer to Figure 4-10 in the preceding chapter (p. 119) to visualize the experimental design structure for the within-subjects comparisons.

Classification Performance Measures

The principal dimension of interest in this study is classification performance. It is first assessed using a simple binary score of classification correctness (0 = incorrect/1 = correct). A second measure is a rating score obtained by incorporating subjects' expressed confidence in their classification judgment (see Figure 4-5). This latter variable thus consists in a combined classification/confidence scale ranging from 1 = very confident incorrect to 10 = very confident correct.

Planned Analytical Comparisons

The predicted pattern of results is illustrated in Figure 5-2 and the corresponding analytical comparisons between the experimental conditions are summarized in Table 5-8. According to predictions, when there is no priming, memory subjects should be better at classification than rule subjects in the short delay condition (analytical comparison C_1) but should be worse in the long delay condition (C_2). This is because memory subjects are assumed to classify stimuli by making integral comparisons with memory exemplars. In the early stage of judgment

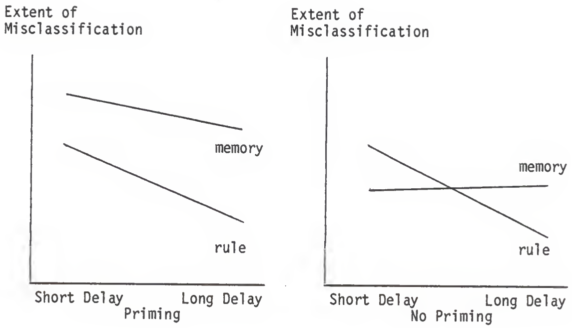

Figure 5-2. Predicted Pattern of Results.

Table 5-8

Analytical Comparisons

Analytical Comparison	Group 1: No Priming Short Delay Memory	Group 2: No Priming Short Delay Rule	Group 3: No Priming Long Delay Memory	Group 4: No Priming Long Delay Rule	Group 5: Priming Short Delay Memory	Group 6: Priming Short Delay Rule	Group 7: Priming Long Delay Memory	Group 8: Priming Long Delay Rule
C_1	+	-						
C_2			-	+				
C_3					-		+	
C_4		-		+		-		+
C_{5a}							-	+
C_{5b}					-	+		
C_{6a}	+		+		-		-	
C_{6b}			+				-	
C_{6c}	+				-			
C_{6d}	-		+		+		-	

such a strategy should be more efficient than that consisting in applying a known classification rule on the objects' features. However, the advantage should disappear as more time is allowed.

When there is a retrieval cues (priming) manipulation, memory subjects should be worse at classifying in the short than in the long delay condition (C_3), whereas rule subjects should display more misclassifications in the short than in the long delay condition whether there is priming or not (C_4). As recalled, if the associative cues succeed in causing memory subjects to retrieve the primed memory instances to guide the categorization process, this should result in more classification errors. The reason is that the stimulus arrangement is organized such that the priming stimuli are more similar to the exemplars belonging to the incorrect category. But the associative cues should have more impact in the short delay condition; with a longer deliberation time memory subjects can scan their memory more fully, use more exemplars of both categories to infer membership and, consequently, increase their chances of being correct. As for rule subjects, the impact of associative cues is predicted to be nonexistent since they should concentrate on rule implementation in both experimental phases. Their performance in classification should be a direct positive function of the time allowed for that task.

As Figure 5-2 shows, when there is priming the classification performance of memory subjects relative to that of rule subjects should be worse in both the long (C_{5a}) and short (C_{5b}) delay conditions. The prediction follows directly from the above discussion and from the

expectation that rule subjects will be very efficient in the long deliberation time condition.

Finally, memory subjects are expected to obtain worse classification results when there is priming than when there is not (C_{6a}), in both the long (C_{6b}) and short (C_{6c}) delay conditions. However, the difference should be greater in the short delay condition (C_{6d}). These predictions also follow directly from the above discussion.

Comparability of Stimuli

The stimulus arrangement presented in Figure 4-3 was conceived with the intention of using certain classification set stimuli as controls for the priming manipulation. Hence, clocks C and D have the same number of positive and negative features as clock E and should therefore display comparable levels of classification difficulty. This also holds for clocks H and I compared to clock J.

Evidence for the comparability of these stimuli comes from the results of rule subjects' classification performance during the experiment. The proportion of correct classification (PROPORT) and the mean classification/confidence rating scores (SCORE) of all stimuli averaged over delay conditions and for rule subjects only are reported in Table 5-9. As anticipated, the results for stimuli C,D and E (H,I and J) are very similar and specific paired comparisons among these stimuli (Table 5-10) strongly support the comparability assumption. Of course, these results are not totally unequivocal with respect to this issue. It can be argued that the fact that the stimuli show similar degrees of classification difficulty for individuals having been given a rule does not mean that this will necessarily be the case for subjects having to

Table 5-9

Averaged Classification Performance of Rule Subjects for All Stimuli

Stimulus	PROPORT[a]	SCORE[b]	Stimulus	PROPORT	SCORE
A	0.9375	8.9167	F	0.8958	8.7083
B	0.9375	9.0625	G	0.9792	9.3333
C	0.7917	7.8125	H	0.6875	7.0417
D	0.7708	7.6667	I	0.7708	7.4583
E	0.7917	7.5625	J	0.7083	7.6458

a PROPORT = proportion of correct classification.

b SCORE = classification/confidence rating score.

Table 5-10

Results of Analytical Comparisons Between Classification Set Stimuli for Rule Subjects

Comparison[b]	PROPORT[a]		SCORE	
	t-Statistic[c]	P-Value[d]	t-Statistic[c]	P-Value[d]
C,D versus E	-0.13	0.8963	0.33	0.7463
H,I versus J	0.25	0.8025	-0.76	0.4483
A,B versus C,D,E	3.34	0.0016	4.02	0.0002
F,G versus H,I,J	4.82	0.0001	4.38	0.0001

a PROPORT = proportion of correct classification;
SCORE = classification/confidence rating score.

b The comparisons are based on paired observations with 48 rule subjects.

c With 47 degrees of freedom.

d Two-tailed tests.

classify them without such a rule. However, there seems to be no reason to believe that this generalization cannot be made. In the absence of any refutative evidence, it will be assumed that the comparability holds.

Tables 5-9 and 5-10 also show that the results for C, D and E (H, I and J) are different from those of stimuli A and B (F and G). This is explained by the fact that these latter stimuli have four out of five features that are consistent with the category prototypes whereas the others have only three (refer to Figure 4-3). Presumably, rule subjects found it easier to classify stimuli in the correct category when, as defined by the rule, these stimuli possessed more features than necessary for membership. These results show that stimuli A and B (F and G) are easier to classify and, consequently, can not be used as control stimuli for the retrieval cues manipulation.

Design and Analysis Issues

In this study each subject was asked to classify (for acceptability) a total of ten clocks. As explained in the preceding chapter, for half of the stimuli the deliberation time allowed for the categorization task was very short (one second), for the other half it was longer (three seconds). Except for the control groups, in each case one of the stimuli (always the third in sequence) was subjected to a priming manipulation, i.e. its associated brand name was identical to that of two selected clocks appearing in the learning set. The other classification stimuli were taken from the stimulus array (see Figure 4-3) and assigned to either delay conditions according to a latin square arrangement (see Figure 4-9). The resulting design is one where subjects serve

in several treatment conditions and where the repeated-measures configuration is not the same for all subjects.

For example, consider the first line of the latin square arrangement (refer to Figure 4-9 on p. 117), which corresponds to two subjects in each of the learning groups (the first and the seventeenth). As recalled, the relevant clocks are C, D, E, H, I and J. It can be seen that subjects with this profile classified the E clock with a short deliberation time constraint and the other relevant clocks with a longer deliberation time. However, for subjects having been given a profile consistent with the second line of the latin square, the delay was short in the case of the C and J clocks and longer for the others. It can be verified that the repeated-measures pattern is modified again for the third and subsequent lines of the latin square.

This type of design poses certain analysis problems. Since subjects serve in several experimental conditions, the use of standard between-subjects statistical methods is precluded since these methods ignore the nonindependence of observations (see e.g. Latour and Miniard, 1983). On the other hand, statistical methods that take the nonindependence of observations into account necessitate the use of a design where subjects serve in all treatment conditions of the repeated-measures factors (see e.g. Keppel, 1982), which is not the case here. One solution to this problem is to compute for each subject averaged classification performance measures over non priming and priming items and use the resulting scores as dependent variables. This is consistent with considering the stimuli within each level of the priming factor (i.e. C, D, H, I and E, J) as replications and treating the mean response to the

stimuli as the variable of interest. The advantage of this analysis strategy is a significant reduction in the complexity of the original design which makes possible the obtainment of repeated-measures subject configurations that can be analyzed using appropriate statistical methods.

To illustrate, refer again to the latin square arrangement (Figure 4-9). Using average classification performance scores, it can be seen that it is not possible for subjects whose profile is described by the first line to be included in a complete within-subjects Delay X Priming factorial design, since an average score in the no priming-short delay treatment condition can not be computed. This is because none of the relevant non priming stimuli (i.e. C, D, H or I) appears in the short delay condition. However, for subjects associated with the second line of the latin square, four within-subjects average scores can be easily obtained. Their computation is summarized in Table 5-11. For instance, in the no priming-long delay condition, the average is computed over the classification response given to stimuli D, H and I. Table 5-11 also shows how the average scores are computed for profiles described by the third and fourth lines of the latin square.

Three observations on this analysis strategy need to be made. First, both the binary (correct/incorrect) and the classification/ confidence measures are used to generate average scores. The resulting dependent variables can be interpreted as within-subjects average proportion of correct classification (WPROPORT) and average classification/ confidence score (WSCORE). Second, as the computational example shows, the analysis strategy may result in the loss of a few subjects. For

Table 5-11

Example of Computation of Average
Classification Performance Scores

Latin Square Profile	Short Delay No Priming	Short Delay Priming	Long Delay No Priming	Long Delay Priming
First Line	.	.	.	.
Second Line	C	J	$\frac{D + H + I}{3}$	E
Third Line	$\frac{C + D}{2}$	E	$\frac{H + I}{2}$	J
Fourth Line	$\frac{C + D + H}{3}$	J	I	E

instance, in order to get a complete within-subjects Delay X Priming design, the data of four subjects must be put aside. However, as it will become clear later, testing the analytical comparisons do not always require that the same type of design be used. Thus, depending upon the analytical comparison involved, the data of different subjects may have to be discarded. The final observation concerns the appropriateness of this analysis strategy. Intuitively, there is no reason to believe that the adopted solution can in any way lead to results different from those that would have been obtained with the original classification performance measures, i.e. without considering average responses. The stimuli were initially conceived of as replicates and the results on their comparableness from a perspective of categorization difficulty (see Tables 5-9 and 5-10) are consistent with this. In addition, a comparison on a descriptive basis between the experimental results using original and average scores on both classification performance measures indicates that the patterns of results are essentially the same. Again, the reasons for preferring average responses are strictly linked to the requirements of statistical theory and experimental design.

Results

In the following pages, each of the planned analytical comparisons is looked at for statistical significance.

Analytical comparison C_1

The first analytical comparison is between group 1 and group 2 (see Table 5-8). The prediction is that in the short deliberation time condition and in the absence of retrieval cues, memory subjects should

have a better performance in classifying the experimental stimuli. This calls for a simple between-subjects design involving memory and rule subjects. The results of interest are displayed in Table 5-12. Although the measures of classification behave as predicted, the differences do not reach statistical significance.

Before repudiating too rapidly the research prediction on these grounds, it must be noted that its support is probably contingent upon the specific operations that are used to define the rule and the delay. The prediction was that individuals with the knowledge of a rule could not use that knowledge efficiently given the required time to apply the necessary sequential mental operations implied by the rule. On the other hand, individuals unaware of the rule but knowledgeable of typical instances of the evaluative categories of the to-be-classified stimuli could simply make quick comparisons with memory representations and base their judgment on overall similarity. The result was to be a better classification performance by these latter individuals and also, one would feel, a greater facility with the task. The point is that perhaps the hypothesis would not have been rejected if the rule had been more complex or the delay even shorter.

Analytical comparison C_2

When the time allowed for the judgment is longer, the prediction is that rule subjects should surpass amply memory subjects in classification performance (see Figure 5-2). To verify this, groups 3 and 4 are compared in a between-subjects design. The results are summarized in Table 5-13. As expected, the differences for both dependent variables are in the right direction, large and highly significant.

Table 5-12

Results for Analytical Comparison C_1

	Group[a]			
Variable	No Priming Short Delay Memory	No Priming Short Delay Rule	t-Statistic[b]	P-Value[c]
WPROPORT[d]	0.6012	0.5565	0.46	0.3248
WSCORE	6.0506	5.7083	0.56	0.2883

a The comparison groups are independent and each is composed of 28 subjects.

b With 54 degrees of freedom.

c One-tailed tests.

d WPROPORT = average proportion of correct classification;
WSCORE = average classification/confidence score.

Table 5-13

Results for Analytical Comparison C_2

	Group[a]			
Variable	No Priming Long Delay Memory	No Priming Long Delay Rule	t-Statistic[b]	P-Value[c]
WPROPORT[d]	0.5952	0.9018	3.92	0.0002
WSCORE	5.9851	8.6994	4.93	0.0001

a The comparison groups are independent and each is composed of 28 subjects.

b With 54 degrees of freedom.

c One-tailed tests.

d WPROPORT = average proportion of correct classification;
WSCORE = average classification/confidence score.

Taken together the predictions associated with the first two analytical comparisons stem from the theoretical proposition that the kind of knowledge possessed by an individual influences the mental operations applied for inference making and, consequently, impacts on the facility with which a quick or a more reflective judgment is made. Despite non-supportive results with regard to analytical comparison C_1 at the level of classification performance, there is some evidence that antecedent learning conditions had an effect on the ease with which subjects performed the experimental task. While it is obvious to the experimenter that rule subjects were much more comfortable at classifying in the long deliberation time condition, informal discussions with memory subjects reveal that in many cases, the short delay task was retrospectively perceived as being easier. The participants have noted that uncertainty builds up when more time is available. As one subject put it: "in the long time you start looking at the details and question yourself." Such comments provide evidence that the mental processes characterizing memory and rule subjects are, as hypothesized, quite different. As a consequence, while for one group more time means greater ease with the task, for the other it may mean just the opposite.

There is more solid evidence on this issue. Table 5-14 shows the distribution of the estimated within-groups variances of both dependent variables, averaged over relevant non priming and priming stimuli, accross the experimental conditions, and for all subjects. A quite interesting observation is the totally reversed effect of deliberation

Table 5-14

Estimated Variances of the Dependent Variables Within the Experimental Conditions and Analyses of Heterogeneity of Variance

Variable	Learning Group	Delay Condition[a] Short	Long	t-Statistic[b]	P-Value[c]
WPROPORT[d]	Memory	0.0928	0.1180	0.83	0.2054
	Rule	0.0794	0.0285	3.60	0.0004
WSCORE	Memory	4.8251	7.3400	1.47	0.0744
	Rule	3.8885	2.4091	1.66	0.0513

a The comparisons are based on paired observations with 48 memory or rule subjects.

b With 46 degrees of freedom.

c One-tailed tests.

d WPROPORT = average proportion of correct classification;
WSCORE = average classification/confidence score.

time on these variances among memory and rule subjects; the memory subjects variances are consistently smaller in the short delay condition and the reverse is true for rule subjects. These results are consistent with the view that stage of the analysis and prior knowledge--which encourages a specific processing style--have indeed an interactive effect on subjects' uncertainty about the categorization judgments.

That conclusion must however be tempered by two facts. First, though the observed variances display the expected interaction, only one of the statistical analyses of heterogeneity of variance within the conditions of the deliberation time factor leads to clearly significant results (WPROPORT with rule subjects).[1] Moreover, it is not the most informative comparison. Second, one would think that subjects' uncertainty would be tapped by confidence ratings given during the classification task. An examination of those ratings accross the treatment conditions shows that the interaction is not present; in general, memory and rule subjects express more confidence in their judgments in the long delay condition.

<u>Analytical comparison C_3</u>

If the retrieval cues succeed in getting memory subjects to base their judgment on the two relevant memory exemplars, then misclassification errors are likely and, as explained before, more so when the delay

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1 In theory, the statistical test of interest here is the interaction. However, since the learning factor is between-subjects and the delay factor is within-subjects, the resulting design is mixed. An appropriate method of testing an interaction in a mixed two-factor design where the dependent variable is a variance could not be found. Thus, it was decided to settle for comparisons of variances between the delay conditions for each learning group. The Walker and Lev (1953) procedure for contrasting correlated variances was used.

is short, since a longer time allowed for the task gives them an opportunity to retrieve more exemplars. This contrast between short and long delay on the classification performance of memory subjects when retrieval cues are present is the object of analytical comparison C_3. Table 5-15 presents the results of the within-subjects comparisons of interest. As seen, for both dependent variables the contrasts are in the predicted direction. However, by usual standards, they are not statistically significant.

Four explanations can be tentatively offered for this lack of results. The first is related to the specific operations that define the deliberation time dimension; perhaps the delay was not long enough to permit a memory scanning that would have resulted in a better appreciation of the category status of the stimuli. Second, even if the delay was sufficient, subjects may have preferred in many cases to stick to their first impression or, less extremely, that first impression may have simply reduced the impact of subsequent retrieved exemplars. Third, it may be the case that, once a first impression is arrived at, subjects only look for confirmatory evidence, i.e. evidence consistent with the early categorization decision. As Sherman and Corty (1984) point out: "Initial judgments are remarkable in their resistance to reanalysis and reinterpretation. Once a causal analysis is undertaken, subjects are more likely to assimilate new information to this construction than to accommodate the analysis to the new information" (p. 225). Lastly, it should be noted that the results of the comparison depend on the success of retrieval cues in biasing the responses toward the incorrect categories in the short delay condition. That is, if, as

Table 5-15

Results for Analytical Comparison C_3

Variable	Group	Delay Condition[a] Short	Long	t-Statistic[b]	P-Value[c]
WPROPORT[d]	Memory	0.4375	0.5938	1.41	0.0846
WSCORE	Memory	5.0313	5.968	1.37	0.0906

a The comparisons are based on paired observations with 24 experimental memory subjects.

b With 23 degrees of freedom.

c One-tailed tests.

d WPROPORT = average proportion of correct classification;
WSCORE = average classification/confidence score.

predicted, the effect of these cues is not very important when delay is long, one should not expect great differences in classification performance if their impact is also weak when delay is short. There is no way of verifying the plausibility of the first three explanations with the current experimental data. But, as for the fourth explanation, the effect of priming in both delay conditions is examined through analytical comparisons C_{6a} to C_{6d}.

Analytical comparison C_4

The fourth analytical comparison concerns again the effect of delay on classification results, but this time with rule subjects. The prediction is that they should have better results when the deliberation time is long than when it is short. As Table 5-16 reports, the prediction is strongly confirmed for both dependent variables. These are not surprising results. As indicated earlier, after the experimental learning task, rule subjects were very proficient in the utilization of the categorization rule. Though they were not expected to have much difficulty in classifying clocks in the long delay condition, a one-second delay was considered to be a very short lapse of time to apply the rule knowledge.

Analytical comparisons C_{5a} and C_{5b}

Consider again the first two analytical comparisons. They contrast memory and rule subjects' classification performance in the short (C_1) and long (C_2) delay conditions when no retrieval cues are provided. The between-subjects results show that memory subjects fared better when deliberation time was short, although statistical significance was not achieved for either dependent variable (see Table 5-12). When a longer

Table 5-16

Results for Analytical Comparison C_4

Variable	Group	Delay Condition[a] Short	Long	t-Statistic[b]	P-Value[c]
WPROPORT[d]	Rule	0.5486	0.8542	5.50	0.0001
WSCORE	Rule	5.8611	8.4757	4.56	0.0001

a The comparisons are based on paired observations with 24 experimental rule subjects.

b With 23 degrees of freedom.

c One-tailed tests.

d WPROPORT = average proportion of correct classification;
WSCORE = average classification/confidence score.

delay prevailed, rule subjects did significantly better (see Table 5-13).

Now, if the same comparisons are made when retrieval cues are present, it follows from earlier discussions on the effect of priming that rule subjects should have superior classification results in both the short (C_{5b}) and long (C_{5a}) delay conditions. Again, this is because the cues are expected to bias memory subjects toward incorrect categorization.

The results of analytical comparisons C_{5a} and C_{5b} are summarized in Table 5-17. The observed pattern is as predicted; rule subjects perform better in both delay conditions. However, statistically significant results are obtained only when delay is long (C_{5a}). These results are similar to those related to analytical comparisons C_1 and C_2; apparently in the long delay condition the task for rule subjects is so easy that they outperform memory subjects without difficulty. Yet, when delay is short, memory subjects are neither significantly worse (C_{5b}) nor better (C_1) than rule subjects. However, the reversal in the direction of the short delay contrasts depending on the presence or absence of retrieval cues is worth noting (compare Tables 5-12 and 5-17). It suggests that these cues may have had the intended effect on subjects' category judgments. This question is examined in greater detail in the next section.

<u>Analytical comparisons C_{6a} to C_{6d}</u>

The final set of analytical comparisons focuses uniquely on the priming experimental factor. To recapitulate briefly, memory subjects should be worse at classifying experimental stimuli when retrieval cues

Table 5-17

Results for Analytical Comparisons C_{5a} and C_{5b}

Variable	Delay Condition	Learning Group[a] Memory	Rule	t-Statistic[b]	P-Value[c]
WPROPORT[d]	Short	0.4375	0.5313	0.87	0.1941
	Long	0.5938	0.8438	2.32	0.0119
WSCORE	Short	5.0313	5.9375	1.33	0.0936
	Long	5.9688	8.5000	3.73	0.0002

a The comparison groups are independent and each is composed of 32 experimental subjects.

b With 62 degrees of freedom.

c One-tailed tests.

d WPROPORT = average proportion of correct classification;
WSCORE = average classification/confidence score.

are present than when they are not (C_{6a}), in the long (C_{6b}) and short (C_{6c}) delay conditions, although the difference is expected to be more important when delay is short (C_{6d}). The theoretical rationale behind these predictions was elaborated upon earlier (see e.g. the section on Planned Analytical Comparisons).

Consider first the comparisons in each delay condition (i.e. C_{6b} and C_{6c}). Table 5-18 displays the results of the within-subjects analyses. As seen the contrasts are statistically significant when delay is short but in the wrong direction when delay is long. The magnitude of the differences in the latter case (0.0119 for WPROPORT and 0.1578 for WSCORE) suggests however that the reversed differences are not reliable. Thus the empirical data support an exemplar-based explanation in the early stage of categorization. Apparently, subjects used the activated memory exemplars to infer category membership, which led them to make more incorrect assignments. However, with more time for deliberation, the effect of retrieval cues vanishes. Before discussing some of the reasons that may account for these results in the long delay condition, analytical comparisons C_{6a} and C_{6d} are first examined.

The prediction associated with analytical comparison C_{6a} follows directly from those associated with C_{6b} and C_{6c}. That is, if a priming effect is obtained in both delay conditions, then it should also be observed when the data are averaged over these conditions. The results for this contrast are presented in Table 5-19. As expected, the data show that classification performance is better when no retrieval cues are provided, but the difference is not statistically significant for either dependent variable. One reason for this failure to achieve

Table 5-18

Results for Analytical Comparisons C_{6b} and C_{6c}

Variable	Delay[a] Condition	Priming Condition[b] No	Priming Condition[b] Yes	t-Statistic[c]	P-Value[d]
WPROPORT[e]	Short	0.6012	0.3929	1.67	0.0542
	Long	0.5952	0.6071	—	—
WSCORE	Short	6.0506	4.7143	1.86	0.0379
	Long	5.9851	6.1429	—	—

a Only experimental memory subjects are included.

b The comparisons are based on paired observations with 24 experimental memory subjects.

c With 23 degrees of freedom.

d One-tailed tests.

e WPROPORT = average proportion of correct classification;
WSCORE = average classification/confidence score.

Table 5-19

Results for Analytical Comparison C_{6a}

Variable	Group	Priming Condition[a] No	Yes	t-Statistic[b]	P-Value[c]
WPROPORT[d]	Memory	0.5938	0.4792	1.23	0.1149
WSCORE	Memory	6.0000	5.2292	1.26	0.1098

a The comparisons are based on paired observations with 24 experimental memory subjects.

b With 23 degrees of freedom.

c One-tailed tests.

d WPROPORT = average proportion of correct classification;
WSCORE = average classification/confidence score.

statistical significance here is probably that the effect is not obtained when deliberation time is longer (see Table 5-18); this contributes to reducing the differences between the mean classification performance measures.

The last analytical comparison relates to a predicted Delay X Priming interaction, i.e. the effect of priming should be greater when delay is short. This is because, with more time allowed for making the category judgment, the influence of associative cues on biasing memory subjects toward the retrieval of selected exemplars was expected to lessen. Note that the prediction has much in common with that associated with analytical comparison C_3. In fact, they are both saying the same thing except that in the case of C_{6d}, the contrast between short and long delay in the presence of retrieval cues uses as a basis of comparison the same contrast in the absence of cues. As Table 5-20 reports, although the analytical comparison results are in the predicted direction, they are not statistically significant.

Overall, the empirical results and statistical analyses presented with regard to the set of analytical comparisons dealing with the priming experimental factor suggest that the expected effect of retrieval cues on memory subjects' categorization processes occurred when the time given to make the category judgment was short. When this time was longer, there was no significant impact of the cues on classification performance.

One explanation for the lack of results in the long delay condition comes from the theoretical framework. As indicated previously, more time to classify also meant more time to eventually retrieve

Table 5-20

Results for Analytical Comparison C_{6d}

Variable	Coefficients:	No Priming[a] Short Delay (-)	No Priming[a] Long Delay (+)	Priming Short Delay (+)	Priming Long Delay (-)	t-Statistic[b]	P-Value[c]
WPROPORT[d]		0.5764	0.6111	0.4167	0.5417	0.55	0.2953
WSCORE		5.9653	6.0347	4.7083	5.7500	0.84	0.2056

a The comparisons are based on paired observations with 24 experimental memory subjects.

b With 23 degrees of freedom.

c One-tailed tests.

d WPROPORT = average proportion of correct classification;
WSCORE = average classification/confidence score.

additional exemplars on which to base the judgment. Perhaps a three-second delay was sufficient to totally eliminate the impact of the cues instead of simply reducing it. With this explanation, the success of the manipulation is shown to depend again on the operationalization of the delay factor, i.e. a shorter delay (e.g. two seconds) might have resulted in getting a significant, but less important, impact of the priming cues. Note however that by shortening the deliberation time in the longer delay condition, one would expect that the difference in classification performance between the two delay conditions would decrease, if the theory is right. Such results would not help to verify the prediction associated with analytical comparison C_3 which proposes that there should be a reliable difference in classification performance between the short and long delay conditions for memory subjects when retrieval cues are present. Recall that even with the current two-second disparity between the deliberation times of both delay conditions, the difference in classification results is not statistically significant (see Table 5-15). Similar observations apply to analytical comparison C_{6d}. Thus, it can be seen that in order to verify the set of theoretical propositions related to the effect of priming on category judgments over time, the operations used to define the stage of the analysis conceptual variable were to be very precise indeed. Given this, it can be argued that the obtainment of results that correspond as a whole to the pattern predicted by the theoretical framework, even though some do not reach statistical significance, is very positive.

Another reason for the non verification of the predictions might be that the priming manipulation was not constraining enough to subjects. As recalled, the basic maneuver was to expose subjects to specific brand names prior to the presentation of the classification stimuli. Having sensed that the brand names did not have anything to do with the task, some subjects may have voluntarily ignored them, blocking at the same time any possibility of activation in memory.

In order to validate this explanation, comparisons C_{6a} to C_{6d} were analyzed again. This time however, the data were restricted to those memory subjects having admitted that they had used the brand names to help them classify the clocks (see Appendix H) in either or both delay conditions. There are seven subjects having recognized that they did so in the short delay condition, eight in the long delay condition, and five in both treatment conditions. The results of this re-analysis are found in Tables 5-21, 5-22 and 5-23. To facilitate the comparison with previous results, those tables follow the formats of Tables 5-18 to 5-20 in that order. An examination of the observed pattern of results shows that the major change occurs in relation to analytical comparison C_{6b}; while the previous analysis had concluded that there was no effect of priming in the long delay condition (see Table 5-18), the re-analysis with the eight qualifiying subjects leads to contrast results that are now in the predicted direction, though still not statistically significant (see Table 5-21). This improvement in prediction has an impact on the results associated with analytical comparison C_{6a}. As Table 5-23 reports, the priming effect, collapsed over the conditions of the delay

Table 5-21

Further Results for Analytical Comparisons C_{6b} and C_{6c}

Variable	Delay[a] Condition	Priming Condition[b] No	Priming Condition[b] Yes	t-Statistic[c]	P-Value[d]
WPROPORT[e]	Short	0.7738	0.2857	2.33	0.0292
	Long	0.6250	0.3750	1.50	0.0887
WSCORE	Short	6.5833	4.2857	1.36	0.1114
	Long	5.9896	4.3750	1.28	0.1204

a Only qualifying experimental memory subjects are included.

b The short delay comparisons are based on paired observations with 7 qualifying experimental memory subjects and the long delay comparisons are based on paired observations with 8 qualifying experimental memory subjects.

c With 6 and 7 degrees of freedom respectively for the short and long delay constrasts.

d One-tailed tests.

e WPROPORT = average proportion of correct classification;
WSCORE = average classification/confidence score.

Table 5-22

Further Results for Analytical Comparison C_{6a}

Variable	Group	Priming Condition[a] No	Yes	t-Statistic[b]	P-Value[c]
WPROPORT[d]	Memory	0.7000	0.2000	3.59	0.0116
WSCORE	Memory	6.1000	3.4000	1.62	0.0896

a The comparisons are based on paired observations with 5 memory subjects.

b With 4 degrees of freedom.

c One-tailed tests.

d WPROPORT = average proportion of correct classification;
WSCORE = average classification/confidence score.

Table 5-23

Further Results for Analytical Comparison C_{6d}

Variable	Coefficients:	No Priming[a]		Priming		t-Statistic[b]	P-Value[c]
		Short Delay (-)	Long Delay (+)	Short Delay (+)	Long Delay (-)		
WPROPORT[d]		0.8333	0.5667	0.2000	0.2000	1.09	0.1688
WSCORE		6.7667	5.4333	3.8000	3.0000	0.33	0.3794

a The comparisons are based on paired observations with 5 qualifying experimental memory subjects.

b With 4 degrees of freedom.

c One-tailed tests.

d WPROPORT = average proportion of correct classification;
WSCORE = average classification/confidence score.

factor, is now statistically significant for one of the dependent variables. The other results remain essentially unchanged.

Concluding Remarks

Taken as a whole, the within-subjects analyses findings are very encouraging. Of the ten analytical comparisons that have been defined to verify the set of propositions derived from the theoretical framework developed in Chapter Three, only one has led to results in a direction opposite to what was predicted (see Table 5-24). When the re-analyses are considered, all contrasts are in the right direction and half of them are statistically significant by usual scientific standards. Given the precision of the theoretical predictions, their interrelatedness and the strong impinging of operationalizations of the conceptual variables on the experimental outcomes, these are encouraging empirical results indeed.

Between-Subjects Analyses

It must be noted that the preceeding within-subjects analyses are dependent upon one important assumption, that is the comparableness of stimuli. Though the results on the classification performance of rule subjects provided support for the validity of this assumption, they are by no means absolute proof. This is why the experimental design incorporated two control conditions. To repeat, in one condition (equiprobability control) the brand names associated with each priming stimulus (E and J) were identical to those of two specific learning set stimuli, one from each acceptability category. These latter stimuli had the same number of features in common with the priming items so that, assuming the retrieval cues manipulation succeeded and memory subjects

Table 5-24

Summary of the Within-Subjects Analyses Results

Analytical Comparison	Predicted Direction	Statistical Significance[a]	
		WPROPORT	WSCORE
C_1	Yes	n.s.	n.s.
C_2	Yes	$p < .01$	$p < .01$
C_3	Yes	$p < .10$	$p < .10$
C_4	Yes	$p < .01$	$p < .01$
C_{5a}	Yes	$p < .05$	$p < .01$
C_{5b}	Yes	n.s.	$p < .10$
C_{6a}	Yes	n.s.	n.s.
	(Yes)	($p < .05$)	($p < .10$)
C_{6b}	No	—	—
	(Yes)	($p < .10$)	(n.s.)
C_{6c}	Yes	$p < .10$	$p < .05$
	(Yes)	($p < .05$)	(n.s.)
C_{6d}	Yes	n.s.	n.s.
	(Yes)	(n.s.)	(n.s.)

a For analytical comparisons C_{6a} to C_{6d}, results of the re-analysis are indicated within parentheses.

based their categorization decisions on the overall similarity with the two retrieved stimuli, it was expected that the likelihood of being correct would be about the same as that of being incorrect. In the other condition (no cues control), no retrieval cues were provided, i.e. the brand names of the stimuli in the learning and classification sets were all different. Refer to Figure 4-11 in the preceding chapter (p. 120) to visualize the experimental design structure for the between-subjects comparisons.

The rationale behind the inclusion of control groups in the experiment is as follows. First, it must be demonstrated that the categorization results for priming stimuli are affected by the retrieval cues manipulation and are not limited to the particular stimuli chosen. Hence, categorization results when cues are provided must be compared with those obtained when they are not (no cues control). Second, it must also be shown that the cues have the intended effect on categorization processes, i.e. that they activate memory traces that subjects use to infer the acceptability status of priming stimuli, and not simply that they lead to categorization results compatible with the theoretical predictions for whatever reasons. For example, perhaps the mere fact of presenting at classification time brand names that subjects had seen previously leads to a higher propensity to be incorrect (distraction, surprise), independently of the memory associations that these cues might have activated. Such a result would be consistent with the predictions, although the categorization processes explanation would be different. The equiprobability control condition provides a comparison basis to assess the processing effect of the cues. If, as the theory

suggests, the cues bias subjects' exemplar-based category processing, then the misclassification rate of experimental memory subjects for priming stimuli should be higher than that of equiprobability control subjects. In the event that it is not, one would suspect that the effect of the cues was not as intended.

Results

The between-subjects comparisons of interest involve the priming factor in both delay conditions. Comparisons between experimental and no cues control memory subjects are first examined, followed by comparisons between experimental and equiprobability control memory subjects.[1]

No cues control comparisons

Table 5-25 presents the comparison results with the no cues control condition when deliberation time is short. As seen, a statistically significant priming effect is found for both dependent variables with experimental subjects. These are the same results obtained earlier (analytical comparison C_{6c}, see Table 5-18) except for small changes in the t-statistics resulting from the fact that the design now incorporates a between-subjects factor which necessitates the use of a different standard error. Table 5-25 also shows that no cues control memory subjects' classification performance on priming and non priming stimuli is not statistically different for both dependent variables. These results rule out the possibility that the observed higher misclassification rates for priming stimuli in the experimental memory short delay

1 As indicated in the Method Chapter, the control conditions were crossed with the learning factor. Since the pattern of results for rule subjects in the experimental and control conditions is essentially the same, comparisons involving these subjects are not considered.

Table 5-25

Between-Subjects Comparisons with No Cues Control in Short Delay

Variable	Memory Group	Priming Stimuli[a] No	Priming Stimuli[a] Yes	t-Statistic[b]	P-Value[c]
WPROPORT[d]	Experimental	0.6012	0.3929	1.73	0.0466
	No Cues control	0.5833	0.6667	0.32	0.7510
WSCORE	Experimental	6.0506	4.7143	1.87	0.0353
	No Cues control	6.1250	6.1667	0.03	0.9763

a The comparisons are based on paired observations with 28 experimental and 6 no cues control memory subjects in a mixed two-factor Priming X Group design.

b With 32 degrees of freedom.

c One-tailed tests for experimental subjects, two-tailed tests for no cues control subjects.

d WPROPORT = average proportion of correct classification;
WSCORE = average classification/confidence score.

condition are limited to the specific stimuli chosen for providing retrieval cues. Rather, it appears that the difference in classification performance is really due to the presence of retrieval cues.

The comparison results in the long delay treatment condition are displayed in Table 5-26. Consistent with earlier findings (analytical comparison C_{6b}, see Table 5-18), the priming effect in the experimental condition is not statistically significant for either dependent variable. Similarly, no cues control memory subjects' classification performance is not statistically affected by the type of stimuli.

Equiprobability control comparisons

The preceding analyses lead to two conclusions; that experimental memory subjects obtained significantly higher misclassification results in the short delay treatment condition for priming stimuli and that this was brought about by the presence of retrieval cues at classification time. To verify that the effect of the cues on categorization was to render specific exemplars more accessible in memory and that this resulted in more classification errors for experimental subjects, comparisons with the equiprobability control group must be made.

Table 5-27 presents the results of comparing experimental and equiprobability control subjects' performance in classification when delay is short. Again, the priming effect is statistically significant for both dependent variables in the experimental condition. However, the results of interest concern equiprobability control subjects. Table 5-27 shows that their classification results are worse for the priming stimuli and that the differences are significant for the WSCORE dependent variable. Thus the data seem to indicate that the retrieval cues

Table 5-26

Between-Subjects Comparisons with No Cues Control in Long Delay

Variable	Memory Group	Priming Stimuli[a] No	Priming Stimuli[a] Yes	t-Statistic[b]	P-Value[c]
WPROPORT[d]	Experimental	0.5952	0.6071	—	—
	No Cues Control	0.3750	0.6667	1.30	0.2029
WSCORE	Experimental	5.9851	6.1429	—	—
	No Cues Control	4.3750	6.6667	1.34	0.1897

a The comparisons are based on paired observations with 28 experimental and 6 no cues control memory subjects in a mixed two-factor Priming X Group design.

b With 32 degrees of freedom.

c One-tailed tests for experimental subjects, two-tailed tests for no cues control subjects.

d WPROPORT = average proportion of correct classification;
WSCORE = average classification/confidence score.

Table 5-27

Between-Subjects Comparisons with Equiprobability Control in Short Delay

Variable	Memory Group	Priming Stimuli[a] No	Priming Stimuli[a] Yes	t-Statistic[b]	P-Value[c]
WPROPORT[d]	Experimental	0.6012	0.3929	1.76	0.0440
	Equiprobability Control	0.6667	0.1667	1.95	0.0600
WSCORE	Experimental	6.0506	4.7143	1.92	0.0319
	Equiprobability Control	6.5000	3.3333	2.11	0.0428

a The comparisons are based on paired observations with 28 experimental and 6 equiprobability control memory subjects in a mixed two-factor Priming X Group design.

b With 32 degrees of freedom.

c One-tailed tests for experimental subjects, two-tailed tests for equiprobability control subjects.

d WPROPORT = average proportion of correct classification;
WSCORE = average classification/confidence score.

lead to more classification errors as predicted, but that the cognitive processes responsible for these outcomes may not be those that were hypothesized to occur. If memory subjects had based their categorization decisions on the similarity with the exemplars associated with the cues, then a lower misclassification rate should have been observed in the equiprobability control condition since, as explained before, the exemplars in this condition were selected such that there was no bias toward incorrect categorization as in the experimental condition. The fact that the pattern of results is the same in the experimental and equiprobability control conditions suggests that the cues had the effect of worsening subjects' classification performance but that this was not due to exemplar-based category processing.

Table 5-28 shows the comparison results when deliberation time is long. As seen, the classification performance of experimental and equiprobability control memory subjects is not significantly affected by the presence of retrieval cues.

The comparison results involving the equiprobability control memory group when deliberation time is short are very disconcerting. Taken at face value, they imply that the retrieval cues had a negative effect on subjects' classification results, as expected, but that the effect was not mediated by nonanalytic processes. In theory, if such processes had taken place, equiprobability control memory subjects' performance in classifying priming stimuli would have been superior to that of subjects in the experimental group, since the memory exemplars associated to the retrieval cues in this control condition were defined so as to be nondiagnostic of category membership. In contrast, the cues

Table 5-28

Between-Subjects Comparisons with Equiprobability Control in Long Delay

Variable	Memory Group	Priming Stimuli[a] No	Priming Stimuli[a] Yes	t-Statistic[b]	P-Value[c]
WPROPORT[d]	Experimental	0.5952	0.6071	—	—
	Equiprobability Control	0.4167	0.6667	1.01	0.3201
WSCORE	Experimental	5.9851	6.1429	—	—
	Equiprobability Control	4.9167	6.8333	1.09	0.2839

a The comparisons are based on paired observations with 28 experimental and 6 equiprobability control memory subjects in a mixed two-factor Priming X Group design.

b With 32 degrees of freedom.

c One-tailed tests for experimental subjects, two-tailed tests for equiprobability control subjects.

d WPROPORT = average proportion of correct classification;
WSCORE = average classification/confidence score.

provided in the experimental treatment condition were specified to prime memory exemplars that were high in information value for similarity-based categorization.

There is no easy explanation for these results. One possibility which has been alluded to earlier is that the cues might have surprised subjects and that this contributed to more classification errors. Recall that the cues were brand names that had been shown many times during the learning phase and that those associated with other non priming stimuli were all different. However, two facts plead against this explanation. First, as indicated in the Method Chapter, retrieval cues were presented twice during the classification phase; once with a short deliberation time and once with a longer one. It seems likely that the effect of surprise would decrease greatly the second time the familiar brand names were shown, which was the case for half of the subjects in the short delay condition. Therefore, if there was a surprise, it was more likely to occur during a first presentation, and only half of the subjects in the short delay treatment condition qualify for this event. Hence, the surprise effect had to be quite important to affect the entire group classification performance mean; yet, none of the subjects referred to this during the postexperimental interview.

A second reason for questioning the validity of the explanation is based on the proposition that subjects having been surprised by the cues would probably express less confidence in their categorization decisions. Yet, an examination of the confidence ratings of memory subjects shows that the cues did not significantly alter subjects' confidence, after either the first or second presentation.

There remains another explanation for the results; that the attempt to differentiate experimental and equiprobability control subjects' memory structures either did not succeed or was not sufficiently significant to bring divergent classification outcomes. The experimental manipulation consisted in creating associative memory structures such that, assuming subjects would retrieve the cued exemplars to infer category membership, the probability of correctly classifying the priming stimuli would be higher for these control subjects. Perhaps the resulting memory traces were not organized so as to lead to clearly different exemplar-based categorization decisions.

There is some empirical data relevant to this a posteriori interpretation. Recall that the expected probabilities of correct classification computed from the recognition test data with equation (5-1), assuming the retrieval of primed exemplars, were shown to be smaller in the experimental condition for both priming stimuli, but that the group differences were statistically reliable only for the acceptable stimuli (refer to Table 5-7). This suggests that the differentiation in subjects' memory structures was accomplished for half of the experimental stimuli only. Moreover, for the acceptable stimuli, the treatment magnitude is not very impressive; Hays' (1981) estimated omega squared statistic is found to be equal to 0.07, which means that about seven percent of the variation in the computed expected probabilities of correctly classifying acceptable stimuli is explained by the group effect. If it can be assumed that the recognition test data rightly reflect subjects' memory structures at classification time and that equation (5-1) gives a reasonable estimate of probabilities of correct

classification under an exemplar-based categorization processing strategy, then these results indicate that the groups did not differ greatly in their propensity for correctly classifying priming stimuli. Accordingly, the similarity in the pattern of experimental results would seem to be a logical consequence of this.

Concluding Remarks

Overall, the between-subjects analyses have not brought satisfactory results with respect to the issue of nonanalytic processing. While it seems that the presence of retrieval cues when categorization decisions were made rapidly led to more errors (no cues control), the data are not consistent with a nonanalytic explanation (equiprobability control comparisons). An alternative explanatory scheme suggesting that the cues might have surprised subjects and, consequently, caused the predicted higher rate of misclassification was also found to be inconsistent with other data. In the final analysis, evidence for the failure to adequately differentiate experimental and equiprobabability control subjects' memory structures was presented.

In conclusion, the ambiguity associated with the comparisons between experimental and equiprobability control subjects is an important limitation of this study. Faced with results contrary to predictions, the data do not permit a clear rejection of the theory since the testing conditions are inadequate. In the next chapter, some recommendations to remedy this and other problems are proposed.

CHAPTER SIX
CONCLUSION

In this final chapter, the major findings of the study are summarized, its limitations are discussed and some concluding observations are made. With respect to limitations, methodological issues are emphasized and, in some cases, specific propositions aimed at correcting identified problems are advanced. The conclusion presents some of the avenues for future research that are suggested by the study.

Summary of Findings

The conceptual framework presented in Chapter Three has culminated in a set of five basic research propositions that have guided this empirical study on the use of nonanalytic cognitive processes in evaluative judgment making. In this section of the chapter, each of the propositions is summarized and its empirical support is reviewed.

The first proposition concerns the presumed processing time advantage of exemplar-based evaluation over rule-based evaluation. More precisely, it is proposed that consumers who have no knowledge of evaluative rules but have good category knowledge in the form of memory exemplars should find it easier to generate quick evaluations of category instances than consumers who possess mainly rule knowledge. The time advantage granted to exemplar knowledge consumers comes from the assumption that they will make integral comparisons between instances and memory exemplars. Rule consumers, on the other hand, are assumed to apply the rule knowledge to derive evaluations. When the time allowed for deliberation is short, exemplar knowledge consumers should be in a

better position to make evaluative judgments. Translated into a specific experimental prediction, this research proposition implies that, when delay is short, subjects in the memory condition should have a better classification performance than those in the rule condition. Unfortunately, the classification results presented in relation to this prediction (see analytical comparison C_1) do not support the proposition. As noted in discussing the results, the support of this research proposition clearly depends on the complexity of rule implementation and the operationalization of delay. With greater complexity of rule implementation and/or less time allowed for deliberation, the proposition might have been supported. This suggests the necessity for future research to examine the impact of these two factors.

The second research proposition states that the advantage of exemplar-based over rule-based evaluative processing should disappear as more time is given to make the judgment. In terms of experimental predictions, rule subjects were expected to have better classification performance than memory subjects in the long delay condition. As the classification results show (see analytical comparison C_2), the proposition is strongly supported; in the long delay condition, rule subjects were so proficient that they outperformed memory subjects easily.

The third research proposition is also concerned with the impact of deliberation time on rule knowledge consumers' processing efficiency. Simply stated, with more time given prior to judgment making, rule implementation becomes easier and, consequently, rule knowledge consumers should be in a better position to evaluate. This proposition is also strongly supported by the empirical results (see analytical

comparison C_4); rule subjects were indeed significantly better at classifying stimuli when delay was long than when it was short.

The fourth proposition is quite fundamental to this research study. It concerns the effect of retrieval cues on evaluative responses. As elaborated in Chapter Three, one characteristic of nonanalytic evaluation is its sensitivity to category accessibility; affective reactions depend on which particular category exemplars are retrieved and used as comparison basis for similarity-based categorization processes. In theory, by cuing specific exemplars to render them more accessible in memory, it should be possible to influence the evaluative judgment. This biasing effect of memorable instances (see Lingle, Altom and Medin, 1984) allows to distinguish exemplar-based from probabilistic (i.e. prototype-based) processing.

The research proposition states that biasing retrieval cues should affect exemplar knowledge consumers' evaluations, both in the early and later stages of processing. The empirical results provide mixed evidence on this issue. Within-subjects comparisons of classification performance between stimuli with biasing retrieval cues and stimuli without such cues lead to significant results when delay is short (see analytical comparison C_{6c}), but not when it is long (see analytical C_{6b}). Although some re-analyses have improved the overall pattern of results, the conclusion is still that the effect of the cues on memory subjects' categorization processes occurred only when deliberation time was short. Other results relative to this research proposition are more perplexing. Between-subjects comparisons of memory subjects' performance involving control groups indicate that the biasing

effect of the retrieval cues occurred as predicted, but may have not been mediated by nonanalytic cognitive processes. However, given the weakness of the testing conditions in this latter set of comparisons, no firm conclusion on the nature of the effect of biasing retrieval cues in the experiment could be reached.

The last research proposition also deals with the impact of retrieval cues on evaluation. It asserts that this impact should be more important in the early than in the later stages of processing. The empirical results did not support the proposition (see analytical comparisons C_3 and C_{6d}). It must be noted that, even if results had been supportive, the ambiguous status of the retrieval cues manipulation, as revealed by between-subjects analyses, would leave considerable doubt as to the appropriateness of interpreting them.

Limitations

Many methodological weaknesses have emerged during and after the conduct of the experiment. They have contributed to various degrees to limit the internal and external validity of this study. These weaknesses are briefly examined below.

Comparability of Stimuli

In Chapter Five, some time was spent trying to demonstrate that priming and non priming stimuli are comparable in terms of classification difficulty. This is because the effect of the retrieval cues manipulation is inferred from the comparison of these two types of stimuli. However, small modifications of the experimental design would have made this a posteriori demonstration unnecessary and insured that comparisons between priming and non priming items reflect only the effects

of the cues on classification performance. Thus, by systematically varying the provision of associative cues accross the stimuli, the comparability requirement would have been achieved. For instance, for some subjects the priming stimuli would have been C and I, for others D and J, and so on. This simple method would have permitted to control the stimulus effect by spreading it accross the experimental conditions.

Learning Phase

As recalled, during the learning phase subjects sat in front of a screen on which the pictorial stimuli were projected. Memory subjects had to learn a total of ten brand name/stimulus associations and this necessitated twenty exposures to the stimulus learning set. It became quickly obvious to the experimenter that subjects found this learning-by-repetition exercise very annoying. In some cases, the experimenter had to remind subjects to keep concentrating on the task.

Subjects' irritation could have been avoided by designing a more active and interesting learning task. For example, clocks and brand names could have been reproduced on small cards and the associative memory structure created through a "memory game" where subjects' task would have consisted in placing all cards correctly on a specially prepared structure. Such active participation might have even resulted in better memory for the stimuli, their brand names and respective category membership.

Subjects

There are two aspects relative to subjects in this study that need to be considered: their number and their type. First, the number of participants in the experiment was probably not sufficient,

especially in the control conditions where there were only eight subjects in each learning group. With such small sample sizes it is risky to conclude that the groups are equivalent and homogeneous on nontheoretical variables; the notion of equivalence in experimentation is one of mathematical expectation and, as such, is directly related to the number of subjects issue. When sample size is inadequate, one is less confident that the experimental groups can be compared and, consequently, is inclined to question the empirical data, particularly when theoretical predictions are not confirmed and alternative explanations are not found. For instance, while the problems encountered with equiprobability control subjects can not be simply attributed to the fact that the group size is too small, it must be nevertheless recognized that the small sample issue contributes to decrease faith in the empirical results.

The second aspect concerns the use of students as experimental subjects in this study. Students and especially business students are, in general, reflective. They have learned to deal with new situations by adopting a problem solving approach. Thus, confronted with stimuli that have commonalities and seem to be defined according to some categorization rule, they might just attempt to find out what it is, despite the experimenter's insistance on not engaging in such quest. Clearly, some subjects in the present study may have not resisted to the temptation of deriving a classification rule. At least two memory subjects came out with their own algorithm to classify new stimuli when they were asked to guess what the positive and negative features were (Appendix I). This behavior shows that nonanalytic processing may be less likely

for certains kinds of people and that individual differences may need to be taken into account in any research study interested in these processes. In the present case, the use of real consumers (e.g. housewives) as subjects might have brought radically different results, or measuring individual differences in reflectivity might have permitted a more refined analysis (see Ward, 1983 for an example).

Nature of the Stimuli

It was mentionned in Chapter Two that the nature of stimuli influences the processing style of subjects in experimental studies of evaluative judgment making. For instance, verbal stimuli would probably incite a more analytic processing style than visual stimuli. In this study, a decision was made to utilize pictorial stimuli to allow for more intuitive processing. However, an examination of these stimuli (see Figure 4-2) reveals that they too possess characteristics that encourage analytic processing, the most obvious being that they are highly decomposable. This characteristic is in fact so manifest that it would be hard to believe that subjects were disciplined enough to restrain from making any inferences about the analytic mechanism governing category membership.

The choice of experimental stimuli is not an easy problem to deal with in a study such as this, because two processing strategies are opposed and the stimuli need to be consistent with both, while not favoring one in particular. The issue certainly needs to be examined more closely in future research studies.

Reaction Time

A final methodological limitation of this study lies in its restriction to a single type of dependent variable: accuracy of classification. This measure is of interest since it provides information on subjects' difficulty with the task. However, another way of getting at this variable is through the use of reaction time. One advantage of using latency of classification as dependent variable in this study is that it would eliminate the need to manipulate deliberation time, since subjects would be given control over this aspect of the judgment task. Hence, the previously mentioned problems associated with the operationalization of delay (see Chapter Five) would also vanish. A second advantage would be to allow the provision of converging empirical evidence on the nature of nonanalytic processes in evaluative judgment making.

Conclusion

This research study has delved into a largely unexplored research area in consumer behavior. Until recently, the use of nonanalytic processes in affect formation was ignored by consumer researchers, in spite of the fact that the occurrence of such processes would appear to be quite common given the large number of trivial decisions made by consumers every day (see also Kassarjian, 1978). The field has literally consecrated the algebraic model view of evaluative judgment making and this study is believed to be the first attempt at providing empirical support for an alternative conceptualization that builds on what has been learned about how individuals perceive and organize their stimulus environment.

Three basic ideas have been put forward in the present work. First, it has been argued that it is more appropriate to conceive of affect as an evolving internal reaction rather than a final state that is reached after the performance of a succession of processing operations on psychological elements (e.g. cognitive representations of features, beliefs). A progression from intuitive to more deliberative forms of evaluative processing is consistent with this view. Second, among the many individual differences variables that might impact on the use of analytic and nonanalytic processes, the differential availability of memory exemplars and cognitive rules was said to be fundamental. Finally, it has been asserted that, in the nonanalytic mode, retrieval cues in the immediate environment probably play an important role since they may render more accessible memory exemplars upon which initial similarity judgments will be based.

As this chapter shows, the research study that was designed to investigate these ideas has numerous conceptual and methodological weaknesses. Accordingly, it might be preferable to consider it as preliminary in the sense that it may serve to clear the way for better thought, better designed, more valuable research. Hopefully, the various suggestions that have been made to improve the experiment will be useful for further examination of the research issues addressed in this work.

Because of the relative novelty of the research questions, the direction taken by this study has been rather theoretical, and the issue of pragmatic relevance has been carefully avoided. Yet the problem of how consumers form evaluations of marketplace objects (brands, products,

companies) is of great interest to applied marketing researchers, as illustrated by the continuing popularity of multiattribute attitude models (see Chapter Two). The marketing applications implied by the notion of exemplar-based evaluative judgment making may be more subtle, but as important. The research area of trademark infringement (see Miaoulis and D'Amato, 1978; Levy and Rook, 1981) constitutes one interesting example. Consider the following quotation:

> Under normal buying conditions, where a consumer may cursorily examine a product, we can reasonably assume that the more similar two trademarks are perceived to be by the consumers, the more likely they are to elicit similar responses (product expectations, beliefs). (Miaoulis and D'Amato, 1978, p. 50)

These researchers argue that consumer confusion implies that "the positive attitudes that have been linked to the first trademark are generalized to the second product in a way that leads to buying behavior" (Miaoulis and D'Amato, 1978, p. 51). The correspondence with exemplar-based evaluation is direct. But, Miaoulis and D'Amato's (1978) analysis of consumer confusion centers around the learning concept of stimulus generalization. The approach described in this research, being cognitive in orientation, may offer a contrasting perspective on the nature of the processes which underly consumer confusion.

There is no doubt that research such as that concerned with consumer confusion of trademarks is of interest from an applied perspective. However, there is also a need for even more research of a theoretical nature. Many potential areas of investigation could certainly be identified. Three believed to be of particular importance are proposed here. First, research on the use of nonanalytic, category-based

evaluation must be done at the level of true affective responses. One prime limitation of the present work is that affect was never really involved in the interaction of subjects with experimental stimuli. It would be difficult to argue that subjects in this study had any feelings toward the experimental stimuli that were shown to them other than those resulting from simple classical conditioning processes.[1] In fact, the experimental task did not ask for any affective involvement from the subjects; all they had to know or infer was the acceptability status of pictorial stimuli. This is somewhat disturbing given that this research is concerned with the role of nonanalytic processes in evaluative judgment making. The experiment appears to be more of a demonstration study than a true exploration into the processes of affect formation. It would seem worthwhile to take a step back to examine this issue and decide on appropriate ways of investigating it.

A second area where research efforts might be put is that concerned by the impact of first impressions on subsequent evaluative judgments. Within the perspective of affect as an evolving internal reaction, the consequences associated with the fact that evaluative responses may come very early in the process must be looked at; it is of interest to study how these primary feelings may affect the processing

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1 Evidence for conditioning comes from the features liking data (Appendix J). In general, subjects' pattern of positive and negative features, as defined by the stimulus arrangement, had an impact on subsequent evaluative ratings. For instance, subjects having been told (rule condition) or having inferred (memory condition) that octagonal shape was a positive feature gave higher evaluative ratings to that feature than subjects whose stimulus arangement defined circular shape as positive. This was observed for all ten features and the differences were statistically significant in six cases (two-tailed test using the sum of rating scales as dependent variable).

and content aspects of further analytic evaluation. There are some interesting and thought-provoking research questions in need of answers. Is there a primacy effect in evaluative judgment making similar to that typical of recall experiments? For example, if a first impression is negative but the individual modifies it to positive after some analysis, will the negative impression nevertheless stay in memory and be possibly activated subsequently? If both early and final evaluations are stored in memory, what are the factors that are determinants of their later retrieval? How does the individual deal with inconsistent early and final affective responses that are stored in memory? Is the manner by which negative first impressions influence the processing and context aspects of subsequent analytic evaluation comparable to that of positive first impressions? These are some of the numerous research questions that are suggested by the nonanalytic-to-analytic evaluative processing sequence.

Lastly, research is needed to further specify the conditions that will induce exemplar-based evaluative processes. The situational and individual differences variables that have been listed in Chapter Three might be an interesting place to start. Investigating the effects of these factors would constitute a very fruitful research program.

APPENDIX A

INFORMED CONSENT

EVALUATIVE JUDGMENT MAKING BY CONSUMERS

(PHASE 2)

In this study you will be shown slides of professional drawings of consumer products. You will be told that some of these products are acceptable and others are unacceptable from the perspective of an eventual purchase. Your task will consist of learning which products are acceptable and which are not. Additional questions on products from the same product class will follow. There is no risk involved and all results will be reported so as to preserve your anonimity.

Compensation for your participation in this study will consist of course credit for MAR 3023.

You may discontinue your participation at any time. If you have further questions, contact Alain d'Astous, the principal investigator for this study (391-0300), or ask the experimenter now.

I have read and understand the procedure described above. I agree to participate in the procedure and I have received a copy of this description.

Participant's Signature ______________ Date ______________

Witness' Signature ______________ Date ______________

APPENDIX B

STIMULUS RANDOMIZATION PROCEDURES AND DEFINING FEATURE RULE ANALYSIS

Randomization Procedures

The stimuli used in the experiment are clocks composed of five binary dimensions (refer to Table 4-1 for the definition of these dimensions and to Figure 4-2 for examples of the stimuli). For all subjects, the experiment consisted of two phases: the learning phase and the classification phase. The clocks that were shown during the learning and classification phases followed a particular arrangement which was the same for all subjects. This stimulus arrangement is presented in Figure 4-3. The notational system used to symbolically represent the clocks (i.e. strings of positive or negative signs) is explained in the Stimulus Arrangement section (p. 93).

While the stimulus arrangement presented in Figure 4-3 was constant across subjects, the specific sets of clocks composing the arrangement varied across subjects. To see how this is possible, consider the first stimulus in the learning set, i.e. the string of five negative features, and refer to it as the basic pattern. Suppose that the five negative features are from left to right the following: thin frame, stylized hands, circular shape, inside minute indicators and straight numerals. With this basic pattern (i.e. order and feature values) the entire stimulus arrangement is specified. For example, the fifth clock (i.e. + - - - +) would have a thick frame, stylized hands, circular shape, inside minute indicators and stylized numerals. Suppose now that the features of the basic pattern are from left to right the following: circular shape, stylized numerals, inside minute indicators, thick frame and stylized hands. With this new definition of the basic pattern, the

whole arrangement is modified. For example, the fifth clock would now have an octagonal shape, stylized numerals, inside minute indicators, thick frame and straight hands.

Now, there are thirty-two possible ways of defining the basic pattern (because of the five binary dimensions). These thirty-two patterns were used in the study and assigned to thirty-two subjects in the memory and rule conditions. In addition to systematically varying the features composing the basic pattern, the order of the features (i.e. from left to right) was randomly varied for each of the thirty-two possibilities. For example, suppose one subject had the following pattern: straight numerals, circular shape, outside minute indicators, thin frame and stylized hands. A random sequence of five numbers was then generated and used to specify the order of the features. Suppose the sequence was the following: 3, 5, 1, 2, 4. Thus, the basic pattern for this subject became outside minute indicators, stylized hands, straight numerals, circular shape and thin frame. Note that by modifying the order of the features defining the basic pattern, the clocks composing the stimulus arrangement change.

Defining Feature Rule

One important question relative to the stimulus arrangement used in this study concerns the possibility of obtaining classification results consistent with the theoretical predictions when the categorization processes are different from those assumed to have occurred. More precisely, if memory subjects use a defining feature (s) rule to generate their classification of the stimuli in the second phase of the experiment, it is of interest to examine whether this would affect the

outcomes in a manner consistent with the theoretical predictions related to exemplar-based processes and the retrieval cues manipulation.

The theoretical predictions are as follows. If exemplar-based categorization processes characterize experimental memory subjects then: (1) the categorization accuracy for stimulus E will be lower than that for stimuli C and D, and (2) the categorization accuracy for stimulus J will be lower than that for stimuli H and I. The rationale behind these predictions is presented in the Retrieval Cues Manipulation section (p. 108).

The present analysis is based on three weak assumptions. First, if subjects decide to use a rule, they will concentrate on one or perhaps two features. Second, the rule will be consistent with higher frequency features of the learning set. Finally, given the randomization scheme (see previous section), the position of the features will vary from subject to subject and should be, from a mathematical expectation point of view, spread equally accross the sequence of five strings.

The symbolic representation of the stimuli of interest is the following (from Figure 4-3):

Unacceptable		Acceptable	
C	- + + - -	H	+ - - + +
D	+ + - - -	I	+ + - + -
E	- - + - +	J	+ + - - +

Suppose that subjects use a one defining feature rule to classify the stimuli. How would the classification of E compare to that of C and D? Since the position of the feature will vary from subject to subject,

each case must be looked at. Consider the case where the feature is in the first position; then E and C would be correctly classified as unacceptable and D would be incorrectly classified as acceptable. If it is in fourth position, all three clocks would be correctly classified. Suppose that a two defining features rule is used. Again, all possible position of the features must be considered. For instance, if the positions are first and fourth, the E and C clocks would be correctly classified. As for the D clock, the rule cannot be applied since the features are in contradiction (the first is positive and the fourth is negative). In that case, it seems likely that subjects would simply guess.

Let us define a classification score such that it equals 1 if categorization is correct, 0 if it is incorrect and 0.5 if it is guessed (case of two contradictory defining features). It is possible to consider every combination of rule (i.e. one versus two defining features) and position of the features and obtain classification scores for all stimuli. The sums of scores over all combinations of rule and position will result in an overall score of classification accuracy for each stimulus. These operations are summarized in Table B-1.

Table B-1 shows that the resulting classification scores of all stimuli are fairly comparable. Hence, the use of a defining feature (s) classification rule does not seem to bias classification accuracy toward the confirmation of the theoretical predictions. If this had been the case, overall classification scores of the E and J stimuli would have been lower than those of the other stimuli.

Table B-1

Computations of Overall Classification Scores for Stimuli C, D, E, H, I and J

Rule (number of features)	Position of Feature (s)	Classification Score of E	C	D	H	I	J
One	First	1	1	0	1	1	1
One	Second	1	0	0	1	0	1
One	Third	0	0	1	0	0	0
One	Fourth	1	1	1	0	1	1
One	Fifth	0	1	1	1	1	0
Two	First-Second	1	0.5	0	1	0.5	1
Two	First-Third	0.5	0.5	0.5	0.5	0.5	0.5
Two	First-Fourth	1	1	0.5	0.5	1	1
Two	First-Fifth	0.5	1	0.5	1	1	0.5
Two	Second-Third	0.5	0	0.5	0.5	0	0.5
Two	Second-Fourth	1	0.5	0.5	0.5	0.5	1
Two	Second-Fifth	0.5	0.5	0.5	1	0.5	0.5
Two	Third-Fourth	0.5	0.5	1	0	0.5	0.5
Two	Third-Fifth	0.5	0.5	1	1	0.5	0.5
Two	Fourth-Fifth	0.5	1	1	0.5	1	0.5
	TOTAL:	9.5	9.0	9.0	9.5	9.0	9.5

APPENDIX C

INSTRUCTIONS TO MEMORY SUBJECTS

INSTRUCTIONS

(Please read carefully)

In this study we are interested among other things in people's memory for consumer products. During the next few minutes you will be shown a series of projected slides picturing professionally drawn wall clocks. The clocks will vary over five dimensions (the experimenter will show you some examples when you are done with reading the instructions). In order to make it more realistic each clock has been associated with a brand name (e.g. Seiko). To facilitate your reading the brand name, it will not appear on the clock but will be presented on a separate slide prior to showing the clock itself (the slide will say e.g. "the following clock is a Seiko"). There are ten clocks and we want you to imagine that some are acceptable. You can assume that acceptable clocks have more positive characterisics than negative characteristics, and the reverse is true for unacceptable clocks. You will not be required to judge the acceptability of a clock yourself. Rather, the experimenter will label each clock by saying "yes" (for acceptable) or "no" (for unacceptable) while it is being projected. Your only task is to look carefully at these clocks and try to remember first the clocks themselves, and second their classification as provided by the experimenter. This is very important because following the presentation you will be given a recognition test where you will have to select among twenty clocks the ones that were presented. Ten of these clocks will have been presented, the others will be new. Note that this is not an easy task. Though the new clocks are not the same as the ones you will

have seen, they will be composed of the same characteristics. Consequently, they will be highly similar. There is one strategy that can help you with this task; it is to use the brand names as associative cues. In simple words, during the presentation of the slides try to make clear associations between brand names and clocks. This is a good strategy because during the recognition test you will be provided with the brand names and these should help you recall the clocks and their classification.

Now, the experimental procedure will be as follows. First you will see a slide announcing the brand name of the clock, then another slide picturing the clock. The experimenter will either say "yes" or "no" during the projection of the clock. Then, another slide will follow announcing the brand name of another clock, and so on for the ten clocks. Because of the difficulty of this task, we will need to go over the entire set of slides several times. At first you will be confused, but after a few exposures you will become quite familiar with the slides and you should develop a good memory for the brand names, the clocks, and their classification. However, as mentioned previously, this will necessitate several exposures to the set of slides and it is likely that at some point it will get somewhat tedious. <u>Nevertheless, it is necessary for the success of this study that you keep concentrating on the clocks no matter how many times they are shown to you.</u>

The experimenter will now answer any questions that you may have concerning this task and will show you the dimensions over which the clocks will vary through some visual examples.

APPENDIX D

INSTRUCTIONS TO RULE SUBJECTS

INSTRUCTIONS

(Please read carefully)

In this study we are interested among other things in people's ability to learn and apply evaluative classification rules. During the next few minutes you will be shown a series of projected slides picturing professionally drawn wall clocks. The clocks will vary over five dimensions (the experimenter will show you some examples when you are done with reading the instructions). In order to make it more realistic each clock has been associated with a brand name (e.g. Seiko). To facilitate your reading the brand name, it will not appear on the clock but will be presented on a separate slide prior to showing the clock itself (the slide will say e.g. "the following clock is a Seiko"). There are ten clocks and we want you to imagine that some are <u>unacceptable</u>, say from a purchase point of view, whereas others are <u>acceptable</u>. As a rule, acceptable clocks have more positive characteristics than negative characteristics, and the reverse is true for unacceptable clocks. You will not be required to judge the acceptability of the clocks from your own perspective. Rather, <u>the experimenter</u> will tell you which characteristics are positive and which are negative so as to allow you to classify any clock if necessary. Your only task will be to look carefully at the clocks and inform the experimenter of the acceptability of the clock by saying "yes" (for acceptable) or "no" (for unacceptable) while they are being projected.

Now, the experimental procedure will be as follows. The experimenter will tell you which characteristics are positive and which are negative. You will then be given some practice to make sure that you understand very well the task. Immediately after, the classification task will begin. First you will see a slide announcing the brand name of the clock, then another slide picturing the clock. You will have a few seconds to make a judgment of acceptability by saying "yes" or "no". Then another slide will follow announcing the brand name of another clock, and so on for the ten clocks. Because, you may find it a little difficult at first to classify the clocks given the time frame that you will have, we will need to go over the entire set of clocks a few times. You will see that quickly the task will become too easy. <u>Nevertheless, it is important for the success of this study that you keep classifying the clocks efficiently and seriously as we progress through the task.</u>

The experimenter will now answer any questions that you may have regarding the task and will proceed with the remaining instructions.

APPENDIX E

EXPERIMENTER'S RULE LEARNING RECORD SHEET

RULE CONDITION (LEARNING PHASE)

SUBJECT NO ________ DAY/TIME ________ RULE ________

SLIDE	CLOCK #	CORRECT. CLASSIF.	SUBJECT'S CLASSIF.(1)	(2)	(3)	(4)	(5)
1	____	____	____	___	___	___	___
2	____	____	____	___	___	___	___
3	____	____	____	___	___	___	___
4	____	____	____	___	___	___	___
5	____	____	____	___	___	___	___
6	____	____	____	___	___	___	___
7	____	____	____	___	___	___	___
8	____	____	____	___	___	___	___
9	____	____	____	___	___	___	___
10	____	____	____	___	___	___	___

EXPERIMENTER'S REMARKS: ____

APPENDIX F

EXPERIMENTER'S CLASSIFICATION RECORD SHEET

CLASSIFICATION PHASE

SUJECT NO ________ CONDITION ________ DAY/TIME ________

________ DELIBERATION TIME:

SLIDE	CLOCK #	CORRECT. CLASSIF.	SUBJECT'S CLASSIF.	SUBJECT'S CONFIDENCE	CORRECT/ INCORRECT
1	______	______	______	______	______
2	______	______	______	______	______
3	______	______	______	______	______
4	______	______	______	______	______
5	______	______	______	______	______

________ DELIBERATION TIME:

SLIDE	CLOCK #	CORRECT. CLASSIF.	SUBJECT'S CLASSIF.	SUBJECT'S CONFIDENCE	CORRECT/ INCORRECT
1	______	______	______	______	______
2	______	______	______	______	______
3	______	______	______	______	______
4	______	______	______	______	______
5	______	______	______	______	______

EXPERIMENTER'S REMARKS: ____

____

____

____

____

____

____

APPENDIX G

RECOGNITION TEST QUESTIONNAIRE

INDICATE NEXT TO EACH CLASSIFIED CLOCK YOUR CONFIDENCE IN THE CLASSIFICATION WITH:

NOT AT ALL CONFIDENT	1	2	3	4	5	VERY CONFIDENT

SUBJECT NO: _____

CONDITION: _____

ACCEPTABLE (YES) CLOCKS

1. ____________________ CONFIDENCE: _____

2. ____________________ CONFIDENCE: _____

3. ____________________ CONFIDENCE: _____

4. ____________________ CONFIDENCE: _____

5. ____________________ CONFIDENCE: _____

INDICATE NEXT TO EACH CLASSIFIED CLOCK YOUR CONFIDENCE IN THE CLASSIFICATION WITH:

NOT AT ALL CONFIDENT 1 2 3 4 5 VERY CONFIDENT

SUBJECT NO: ____

CONDITION: ____

UNACCEPTABLE (NO) CLOCKS

1. ____________________ CONFIDENCE: ____

2. ____________________ CONFIDENCE: ____

3. ____________________ CONFIDENCE: ____

4. ____________________ CONFIDENCE: ____

5. ____________________ CONFIDENCE: ____

APPENDIX H

CLASSIFICATION STRATEGIES QUESTIONNAIRE

PLEASE READ CAREFULLY

In this study you were asked at one time to classify new clocks as either acceptable (yes) or unacceptable (no), and were given either a very short exposure time or a longer one. Since this is not necessarily an easy task, we would like to know how you proceeded to accomplish this. Please check the statement(s) below that appear(s) to describe best how you did it (you can check more than one statement if you want but <u>only</u> if you think that one is not sufficient to adequately describe what happened):

☐ I just looked at the clock <u>overall</u> and tried to match it with my idea of an acceptable or an unacceptable clock.

☐ I looked at each clock's characteristics <u>in detail</u> and tried to see if it seemed to possess what I think are characteristics of an acceptable or an unacceptable clock.

☐ Some of these new clocks looked very similar to clocks that were shown previously, so I made my judgment based on this similarity, that is I recalled the classification of some similar clock(s) I had seen and classified the new clock accordingly.

☐ Sometimes during the classification task I would see a brand name that had been presented before and this would help me recall the clock(s) that was(were) associated with this brand name and consequently help me classify the new clock.

☐ Others (Please describe): ______________________________

____

____

____

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____

APPENDIX I

RULE DERIVATION ATTEMPT QUESTIONNAIRE

PLEASE READ CAREFULLY

Earlier in this study you were shown a series of wall clocks and told that some were acceptable and others were unacceptable. These clocks differed according to five dimensions.

Some clocks had stylized numerals like

[stylized number three]

Others had straight numerals like

[straight number three]

Some had stylized hands like

[stylized hands]

Others had straight hands like

[straight hands]

Also, the clocks had either the minute indicators inside or outside the numerals, a circular or an octagonal shape, and a thin or thick frame. We said at the very beginning of the presentation that acceptable clocks possess more characteristics that are liked than characteristics that are not liked. Similarly, unacceptable clocks possess more characteristics that are disliked than characteristic that are

liked. Given this information, can you tell which characteristics are liked and which are disliked?

LIKED CHARACTERISTICS (Please list)	DISLIKED CHARACTERISTICS (Please list)
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

How confident are you in the judgment you just made?

NOT AT ALL CONFIDENT 1 2 3 4 5 6 7 8 9 VERY CONFIDENT

APPENDIX J

FEATURES LIKING QUESTIONNAIRE

PLEASE READ CAREFULLY

As you probably noticed, the clocks that you just saw differed according to five dimensions.

Some clocks had stylized numerals like

[stylized number four]

Others had straight numerals like

[straight number four]

Some had stylized hands like

[stylized hands]

Others had straight hands like

[straight hands]

Also, the clocks had either the minute indicators inside or outside the numerals, a circular or an octagonal shape, and a thin or thick frame. In this section of the questionnaire we would like you to judge each of these characteristics just like you did for the clocks. Please answer <u>all</u> questions.

Stylized Numerals

UGLY	1	2	3	4	5	6	7	8	9	BEAUTIFUL
PLAIN	1	2	3	4	5	6	7	8	9	FANCY
ORDINARY	1	2	3	4	5	6	7	8	9	UNUSUAL
PLEASING	1	2	3	4	5	6	7	8	9	DISPLEASING
STYLISH	1	2	3	4	5	6	7	8	9	UNSTYLISH
I DISLIKE IT VERY MUCH	1	2	3	4	5	6	7	8	9	I LIKE IT VERY MUCH

Octagonal Shape

UGLY	1	2	3	4	5	6	7	8	9	BEAUTIFUL
PLAIN	1	2	3	4	5	6	7	8	9	FANCY
ORDINARY	1	2	3	4	5	6	7	8	9	UNUSUAL
PLEASING	1	2	3	4	5	6	7	8	9	DISPLEASING
STYLISH	1	2	3	4	5	6	7	8	9	UNSTYLISH
I DISLIKE IT VERY MUCH	1	2	3	4	5	6	7	8	9	I LIKE IT VERY MUCH

Minute Indicators Outside the Numerals

UGLY	1	2	3	4	5	6	7	8	9	BEAUTIFUL
PLAIN	1	2	3	4	5	6	7	8	9	FANCY
ORDINARY	1	2	3	4	5	6	7	8	9	UNUSUAL
PLEASING	1	2	3	4	5	6	7	8	9	DISPLEASING
STYLISH	1	2	3	4	5	6	7	8	9	UNSTYLISH
I DISLIKE IT VERY MUCH	1	2	3	4	5	6	7	8	9	I LIKE IT VERY MUCH

Circular Shape

UGLY	1	2	3	4	5	6	7	8	9	BEAUTIFUL
PLAIN	1	2	3	4	5	6	7	8	9	FANCY
ORDINARY	1	2	3	4	5	6	7	8	9	UNUSUAL
PLEASING	1	2	3	4	5	6	7	8	9	DISPLEASING
STYLISH	1	2	3	4	5	6	7	8	9	UNSTYLISH
I DISLIKE IT VERY MUCH	1	2	3	4	5	6	7	8	9	I LIKE IT VERY MUCH

Minute Indicators Inside the Numerals

UGLY	1	2	3	4	5	6	7	8	9	BEAUTIFUL
PLAIN	1	2	3	4	5	6	7	8	9	FANCY
ORDINARY	1	2	3	4	5	6	7	8	9	UNUSUAL
PLEASING	1	2	3	4	5	6	7	8	9	DISPLEASING
STYLISH	1	2	3	4	5	6	7	8	9	UNSTYLISH
I DISLIKE IT VERY MUCH	1	2	3	4	5	6	7	8	9	I LIKE IT VERY MUCH

Straight Hands

UGLY	1	2	3	4	5	6	7	8	9	BEAUTIFUL
PLAIN	1	2	3	4	5	6	7	8	9	FANCY
ORDINARY	1	2	3	4	5	6	7	8	9	UNUSUAL
PLEASING	1	2	3	4	5	6	7	8	9	DISPLEASING
STYLISH	1	2	3	4	5	6	7	8	9	UNSTYLISH
I DISLIKE IT VERY MUCH	1	2	3	4	5	6	7	8	9	I LIKE IT VERY MUCH

Thick Frame

UGLY	1	2	3	4	5	6	7	8	9	BEAUTIFUL
PLAIN	1	2	3	4	5	6	7	8	9	FANCY
ORDINARY	1	2	3	4	5	6	7	8	9	UNUSUAL
PLEASING	1	2	3	4	5	6	7	8	9	DISPLEASING
STYLISH	1	2	3	4	5	6	7	8	9	UNSTYLISH
I DISLIKE IT VERY MUCH	1	2	3	4	5	6	7	8	9	I LIKE IT VERY MUCH

Stylized Hands

UGLY	1	2	3	4	5	6	7	8	9	BEAUTIFUL
PLAIN	1	2	3	4	5	6	7	8	9	FANCY
ORDINARY	1	2	3	4	5	6	7	8	9	UNUSUAL
PLEASING	1	2	3	4	5	6	7	8	9	DISPLEASING
STYLISH	1	2	3	4	5	6	7	8	9	UNSTYLISH
I DISLIKE IT VERY MUCH	1	2	3	4	5	6	7	8	9	I LIKE IT VERY MUCH

Thin Frame

UGLY	1	2	3	4	5	6	7	8	9	BEAUTIFUL
PLAIN	1	2	3	4	5	6	7	8	9	FANCY
ORDINARY	1	2	3	4	5	6	7	8	9	UNUSUAL
PLEASING	1	2	3	4	5	6	7	8	9	DISPLEASING
STYLISH	1	2	3	4	5	6	7	8	9	UNSTYLISH
I DISLIKE IT VERY MUCH	1	2	3	4	5	6	7	8	9	I LIKE IT VERY MUCH

Straight Numerals

UGLY	1	2	3	4	5	6	7	8	9	BEAUTIFUL
PLAIN	1	2	3	4	5	6	7	8	9	FANCY
ORDINARY	1	2	3	4	5	6	7	8	9	UNUSUAL
PLEASING	1	2	3	4	5	6	7	8	9	DISPLEASING
STYLISH	1	2	3	4	5	6	7	8	9	UNSTYLISH
I DISLIKE IT VERY MUCH	1	2	3	4	5	6	7	8	9	I LIKE IT VERY MUCH

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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